

## **A NEW AND EXCEPTIONAL SHALLCROSS ONE INCH PRECISION ROTARY SWITCH LINE IS DESCRIBED IN THE ATTACHED LITERATURE**

Review this information and compare it with comparable data for competitive counterparts—we believe you will conclude that Series 1 switches offer superior electromechanical features in their size classification. Whether your need is long life, positive indexing, low contact resistance, low thermal EMF, mechanical reliability, high insulation resistance, low noise, reliable voltage breakdown characteristics, dust protection, or positive shorting and nonshorting action, this unique switch line offers a logical selection.

Not to be overlooked is the **ease of specification** (spec sheets and a comprehensive order code simplify control drawing creation and ordering), **competitive pricing**, and **distributor stock availability** (up to 3 poles).

Precision  
Rotary  
Switches



*shallcross*

CATALOG  
RS 100





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SUBSIDIARY OF **CUTLER-HAMMER**

SHALLCROSS MANUFACTURING COMPANY, SELMA, N. C.  
ZIP CODE 27576 • TEL. 919 965-2341 • TWX 919 770-7839

## THE SHALLCROSS LINE

### PRECISION WIREWOUND RESISTORS

Mil-R-93C Styles  
Hi Reliability Series  
Hi Precision Series  
Ceramic Bobbin Instrument Series  
Printed Circuit Series  
Subminiature Series  
Resistance Networks

### ATTENUATORS

Precision RF Attenuators  
Precision Audio Attenuators

### PRECISION ROTARY SWITCHES

Series 1 (1") Rotary Switches  
Series 2 (1-3/4") Rotary Switches  
Series 4 (2-1/2") Rotary Switches  
12,000 Series Oval Ceramic Switches  
Special Purpose Rotary Switches

### INSTRUMENTS

Resistance Decades  
Voltage Dividers  
Resistance Bridges  
Galvanometers  
Low Resistance Test Sets





# shallcross

## PRECISION ROTARY SWITCH LINE

### INDEX

**FOREWORD** — Shallcross Series 1, 2 and 4 rotary switches constitute an unusually comprehensive and versatile rotary switch line. More importantly their overall quality and performance standards are unsurpassed (and in many areas unequalled) by any similarly classed standard switch group.

| SERIES   | QUICK GUIDE   | DETAILED INFORMATION   | PAGE NUMBER  |
|--|---|--|--|
| <b>SERIES 1</b><br><b>1"</b><br><b>ROTARY</b><br><b>SWITCHES</b><br><b>NEW</b> | <b>MAXIMUM POSITIONS/POLE (shorting) — 12</b><br><b>MAXIMUM POSITIONS/POLE (nonshorting) — 12</b><br><b>MAXIMUM POLES/DECK — 2</b><br><b>INDEXING ANGLE — 30°</b><br><b>MAXIMUM DECKS — 12</b>                            | <b>FEATURES</b><br><b>MECHANICAL DETAILS</b><br><b>DIMENSIONS &amp; MECHANICAL SPECIFICATIONS</b><br><b>ELECTRICAL RATINGS</b><br><b>ORDER CHART (shorting) —</b><br><b>ORDER CHART (non-shorting) —</b><br><b>ORDER CODE</b>  | <b>5</b><br><b>6</b><br><b>7</b><br><b>8</b><br><b>9</b><br><b>10</b><br><b>10</b>   |
| <b>SERIES 2</b><br><b>1¾"</b><br><b>ROTARY</b><br><b>SWITCHES</b>              | <b>MAXIMUM POSITIONS/POLE (shorting) 24 or 32</b><br><b>MAXIMUM POSITIONS/POLE (non-shorting) 12 or 16</b><br><b>MAXIMUM POLES/DECK — 4</b><br><b>INDEXING ANGLES — 11¼°, 15°, 22½°, 30°</b><br><b>MAXIMUM DECKS — 20</b> | <b>MECHANICAL DETAILS —</b><br><b>DIMENSIONS &amp; MECHANICAL SPECIFICATIONS —</b><br><b>ELECTRICAL RATINGS (MIL-S3786 — SR14)</b><br><b>ELECTRICAL RATINGS (commercial) —</b><br><b>ORDERING INFORMATION —</b><br><b>ORDER CHARTS (non-shorting) —</b><br><b>ORDER CHARTS (shorting) —</b><br><b>STANDARD OPTIONS —</b><br><b>DRAWING AND SPECIFICATION SHEET INSTRUCTIONS —</b><br><b>SPECIFICATION SHEETS</b> | <b>11 &amp; 14 (Foldout)</b><br><b>12 &amp; 13 (Foldout)</b><br><b>15</b><br><b>16 &amp; 17 (Foldout)</b><br><b>18</b><br><b>19</b><br><b>20 &amp; 21</b><br><b>22 &amp; 23</b><br><b>24 &amp; 25 (Foldout)</b><br><b>Insert</b> |
| <b>SERIES 4</b><br><b>2½"</b><br><b>ROTARY</b><br><b>SWITCHES</b>              | <b>MAXIMUM POSITIONS/POLE (shorting) — 48</b><br><b>MAXIMUM POSITIONS/POLE (nonshorting) — 24</b><br><b>MAXIMUM POLES/DECK — 4</b><br><b>INDEXING ANGLES — 7½°, 15°</b><br><b>MAXIMUM DECKS — 15</b>                      | <b>GENERAL</b><br><b>DIMENSIONS &amp; MECHANICAL SPECIFICATIONS</b><br><b>ELECTRICAL RATINGS (commercial)</b><br><b>ELECTRICAL RATINGS (MIL-S3786 — SR15)</b><br><b>ORDER CHARTS</b><br><b>SPECIFICATION SHEETS</b>  | <b>26</b><br><b>27</b><br><b>28 &amp; 29 (Foldout)</b><br><b>29 (Foldout)</b><br><b>30</b><br><b>Insert</b>  |

### OTHER SHALLCROSS SWITCHES

Over 500 ceramic and phenolic instrument rotary switch types are described in bulletins L-31A and L-32. In addition, Shallcross has and will continue to design hundreds of special switches for high voltage, motor driven or other unique applications.



# 33

## REASONS FOR SELECTING SHALLCROSS ROTARY SWITCHES

### ELECTRICAL QUALITY

- (1) Initial contact resistances measure less than two milliohms — variations of one milliohm or less typical during the life of the switch.
- (2) Insulation resistances between circuits and ground exceed  $10^{14}$  ohms under normal operating conditions.
- (3) Thermal EMF ratings are less than 1 microvolt/°C.
- (4) Arm and contact designs assure low noise generation during switching.

### MECHANICAL QUALITY

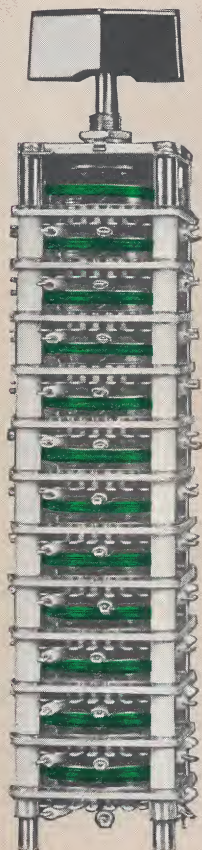
- (5) Precise and rugged detent mechanisms assure positive, long life detenting.
- (6) Integral contacts and terminals provide terminal strength ratings in excess of all military and commercial standards.
- (7) Rugged stop pin construction results in stop strength ratings beyond 50 in lbs.
- (8) All materials are chosen for maximum reliability and electrical performance without cost compromises.
- (9) Precision parts permit the mounting of up to 20 decks on a single shaft without misalignment during operation.
- (10) Compact designs reduce back panel space requirements.
- (11) All shafts are electrically isolated.

### MILITARY RATINGS

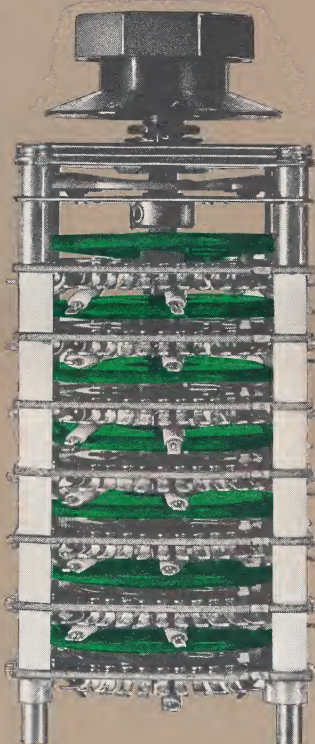
- (12) Series 2 switches meet all requirements of MIL-S-3786 style SR14 (style SR14 encompasses standards that are more stringent than those presented by the general specification).
- (13) Series 4 switches meet all requirements of MIL-S-3786 style SR15 (style SR15 encompasses standards that are more stringent than those presented by the general specification).
- (14) Series 2 switches in conjunction with approved solenoid equipment meet all requirements of MIL-S-3786 style SR16.

### FIELD TESTED

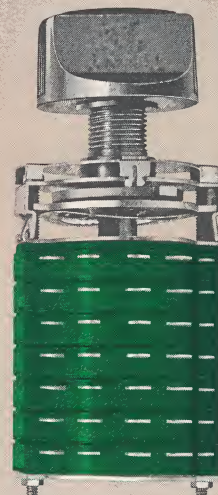
- (15) Shallcross switches have been continuously refined as a result of the knowledge obtained from their field application in such space and



SERIES 2  
PAGE 2



SERIES 4



SERIES 1



missile programs as MINUTEMAN, POLARIS, SUBROC, TFX, and APPOLLO.

- (16) Shallcross switches are consistently employed in commercial instrumentation requiring the best in rotary switching devices i.e., voltage comparator standards, precision resistance decades, precision digital ohmmeters and voltmeters, etc.

## VERSATILITY

- (17) Series 1, 2 and 4 switches permit the selection of any number of positions per deck from 1-48 (shorting) or 1-24 (non-shorting) and 1, 2, 3 or 4 poles/deck.
- (18) Adjustable stops permit field variation of positions/pole.
- (19) Shorting and non-shorting switch decks can be combined on the same switch.
- (20) Optional cluster arms provide progressive shorting or opening switching action.
- (21) Dual concentric shaft option permits the independent switching of two switch groups from a single location (with a consequent reduction in space requirements).
- (22) Most switches are readily available with solenoid drive.
- (23) Spring return options provide spring return action in either or both directions from rest position.
- (24) Standard dust covers are available for protection of arms, contacts and collector rings for many switch types.
- (25) Optional gold plated current carrying parts are provided for corrosion protection if required.

## CONVENIENCE

- (26) Prewired switch assemblies available when preferred.
- (27) Flared extended terminals promote wiring ease.
- (28) Common and #1 positions are provided with easily identified markings.
- (29) Storage protection is assured by "air tight" plastic packaging before shipment.

## SPECIFICATION EASE

- (30) Comprehensive part number systems permit the ordering of all standard switches and most options without drawings or formal specifications.
- (31) Specification sheets when completed provide complete control drawings for customer records and permit easy specification of special or unique requirements.

## COST

- (32) Most Shallcross switches are priced below competitive switches in the same size and quality classification.

## STOCK DELIVERY

- (33) Standard Series 1, 2 and 4 switches (up to 3 decks) are available from stock at the following selected distributors:

Allied Electronics  
100 North Western Avenue  
Chicago, Illinois 60680

Forsberg Electronic Distributors  
125 Perkins Avenue  
Brockton, Massachusetts 02402

Westec Distributing Co.  
504 Main Street  
El Segundo, California

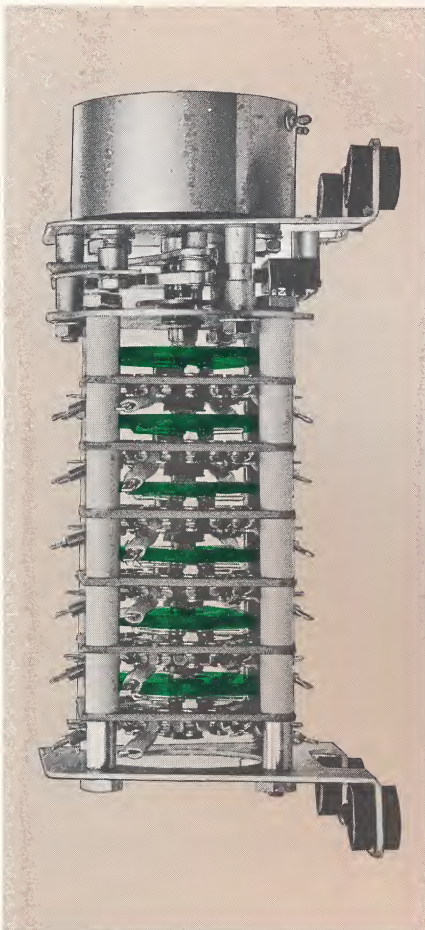
Samco Electronic Sales  
P. O. Box 245  
Fairview Village, Pennsylvania 19409

Taylor Electronics Corporation  
2270 Grand Avenue  
Baldwin, New York 11511

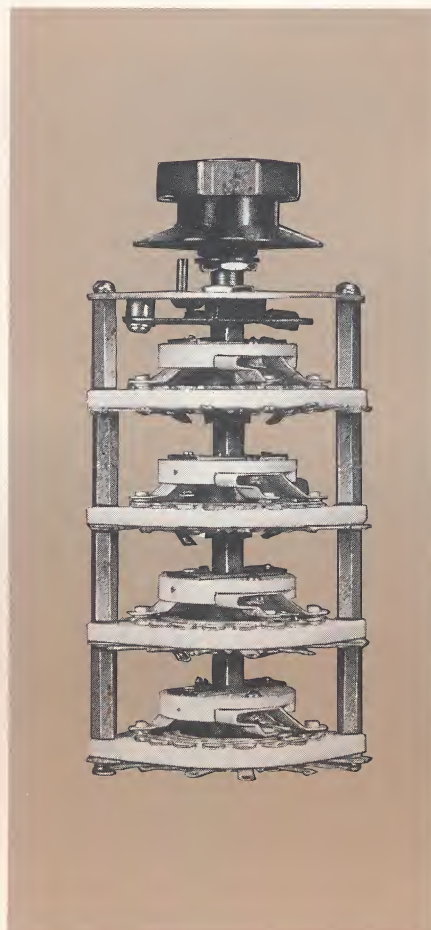
Fastronic  
315 Reading Road  
Reading, Ohio 45215

Southwest Electronics  
3903-05 Richmond Avenue  
Houston, Texas 77027

Production quantities are normally shipped in 2-3 weeks.



SOLENOID DRIVE



12000 SERIES



SPECIAL SWITCHES



**FOREWORD** — Shallcross SERIES 1 (1"), SERIES 2 (1¾"), and SERIES 4 (2½") precision rotary switches are designed to provide a versatile and comprehensive quality switch line that class for class offers peerless dry circuit and low signal level switching performance. Each exhibits exceptional mechanical reliability, positive detenting, very low and stable contact resistance, high insulation resistance, low switching noise, virtually immeasurable thermal EMF, high immunity to premature voltage breakdown, compactness, and environmental ratings in excess of any standards yet established by the military for switches in their class (MIL-S-3786, STYLES SR14, SR15 and SR16).

The specification of Shallcross switches is facilitated by a comprehensive part number system and/or easily completed specification sheets for each switch group. Selection of the correct switch type will be aided by consulting the basic design considerations described below.

## **ELECTRICAL DESIGN CONSIDERATIONS:**

**SHORTING OR NONSHORTING** — Shorting switching action provides a MAKE BEFORE BREAK circuit and nonshorting a BREAK BEFORE MAKE circuit. SERIES 2 and SERIES 4 switches use every other contact for nonshorting action and the available positions/pole are halved as a result.

Contacts on SERIES 2 and 4 nonshorting switches can be strapped in pairs to realize shorting action if both shorting and nonshorting action are required on the same deck or switch.

### **TOTAL NUMBER OF POLES AND POSITIONS/POLE** —

The number of positions/pole and the total number of poles required are the principal controlling factors in determining the appropriate switch series (or switch size) and number of decks. Generally the switch type selected should provide the total number of poles, and positions/pole required on a minimum number of decks to reduce the back panel depth and cost. The switch size, positions/pole, indexing angle, and switching action (shorting or nonshorting) are the controlling factors in determining the maximum poles/deck. If more than one switch series can supply the desired switching action with an identical number of decks, then the smallest switch type with its lower cost is normally preferable. (Make certain the smaller switch has adequate electrical ratings and can physically accommodate all "wired on" components.)

**LIFE VS LOAD RATINGS** — Appropriate life cycle ratings are supplied for each switch group under a number of different load (breaking) conditions. The switch type selected should satisfactorily meet your contact resistance and life requirements when subjected to the load conditions dictated by your application.

**CONTACT RESISTANCE** — Shallcross contact resistance ratings establish the maximum input to output resistance presented by the switch at any position. Variations in contact resistance are contingent upon load conditions, environment and frequency of switch operation. Typical variations under various loads are supplied in the ratings for each switch group.

**VOLTAGE BREAKDOWN** — During operation most rotary switches will experience a reduction in the voltage breakdown point due to metal particle and carbon deposit buildups between switch contacts. "End of life" and initial ratings are supplied to insure proper specification.

**CAPACITANCE** — Switch capacitance, stator dielectric characteristics and the nature of the circuit to be switched are among the factors determining rotary switch frequency limitations. Capacitance ratings are supplied but the factory should be consulted when the switching of high frequency signals is contemplated.

# **DESIGN CONSIDERATIONS**

## **MECHANICAL CONSIDERATIONS:**

**DIMENSIONS** — Exact back panel depths and overall dimensions are provided for all switch types. Consideration should be given to the additional space required for wiring, "wired on" components and rear mounting supports.

**MOUNTING** — (1) Single hole bushing (2) two hole or (3) bushing and two hole mounting configurations are available options for most Shallcross switches. Optional bushing lengths are provided for all bushing mounting types to assure custom mounting to a wide range of panel thicknesses. Two hole mounting methods are preferable for switches with high rotational torque ratings. Rear mounting supports are recommended (a MIL-S-3786 requirement) for switches having over 5 wafers (SERIES 2), 4 wafers (SERIES 4) and 9 wafers (SERIES 1).

**ROTATIONAL TORQUE** — An increase in the total poles/switch and/or decks/switch will present a nearly proportionate increase in the torque required for switch rotation. Two hole mounting, rear mounting supports and larger sized knobs mounted on flatted shafts are recommended for switches having an extended number of poles or decks. (Consult the rotational torque specifications for each switch group.)

**FLATTED SHAFTS** — Certain knob types and switches with high rotational torque characteristics dictate the use of single or double flatted shafts. Flat angles must be specified.

**SPECIAL SHAFT LENGTHS** — Shaft lengths other than the standard 1" length must be specified when required.

**MILITARY CONSIDERATIONS:** SPECIFICATION—MIL-S3786, STYLES SR14, SR15 or SR16 requirements must reference that standard on all drawings and/or purchase orders to assure shipment of switches with the correct markings and mounting dimensions.

**SPECIAL CONSIDERATIONS:** One or more of the following options may be beneficial or required for your application and should be evaluated. (1) PREWIRED TERMINALS, (2) GOLD PLATED CURRENT CARRYING PARTS, (3) CLUSTER ARMS for progressive shorting or opening switching action, (4) DUAL CONCENTRIC SHAFT for reducing panel space requirements, (5) DUST COVERS, (6) SOLENOID DRIVE, (7) PRINTED CIRCUIT MOUNTING TERMINALS, (8) SPRING RETURN DETENT ACTION. These options are described in this catalog.

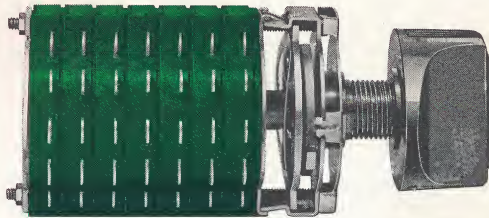




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**SERIES 1**

**ROTARY SWITCH LINE**



**NEW**

**A ONE INCH PRECISION ROTARY SWITCH LINE  
THAT ESTABLISHES THE HIGHEST ELECTRO-MECHANICAL  
PERFORMANCE STANDARDS IN ITS  
SIZE CLASSIFICATION**

Shallcross SERIES 1 switches incorporate the highest electro-mechanical performance standards yet introduced to the one inch rotary switch classification. Specific performance improvements include: superior contact resistance vs load vs life ratings; unsurpassed electro-mechanical reliability during rated life; improved voltage breakdown characteristics; lower switching noise; lower thermal EMF and higher insulation resistance ratings.

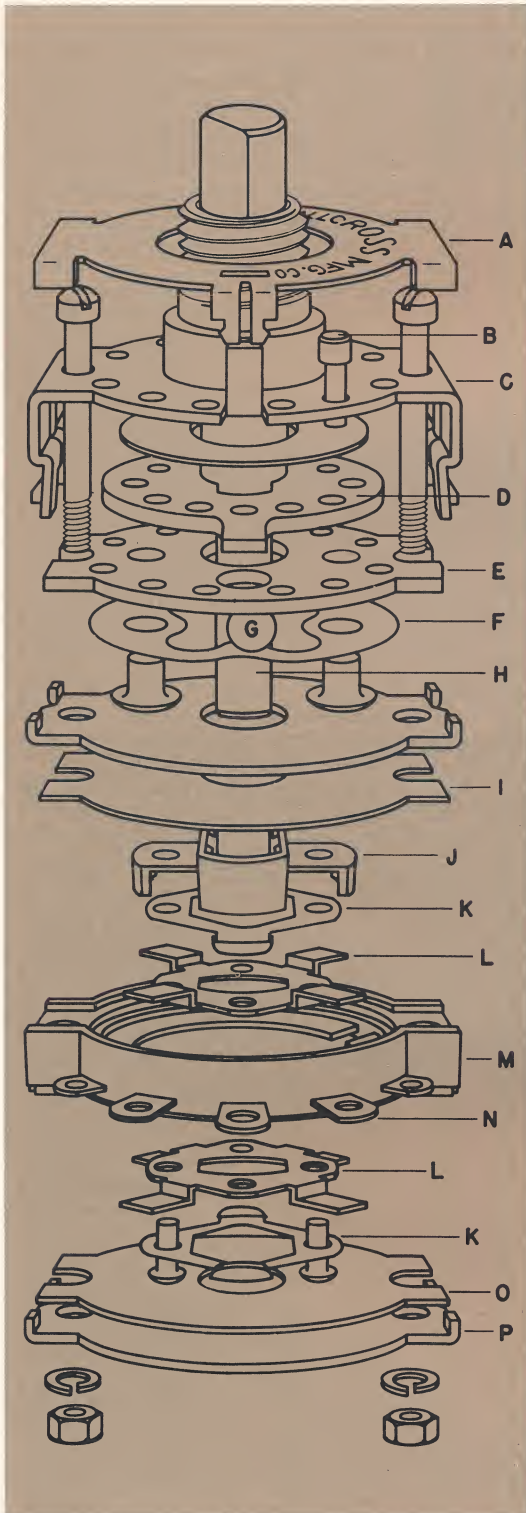
SERIES 1 switches exceed in performance the requirements of Mil-S-3786 (Style SR04) and the most stringent standards presented by commercial instrumentation for switches in this classification. Conservative, definitive ratings are combined with design sophistication, unequalled materials quality and 100% quality control inspection to assure maximum operational reliability.

Ease of procurement and specification are encouraged by reproducible specification sheets, a comprehensive order code system and stock delivery from any of six selected distributors.

The logic of selecting Shallcross SERIES 1 switches for your application can best be confirmed by an objective, comparative evaluation with competitive counterparts.



# SHALLCROSS SERIES 1 MECHANICAL DETAILS

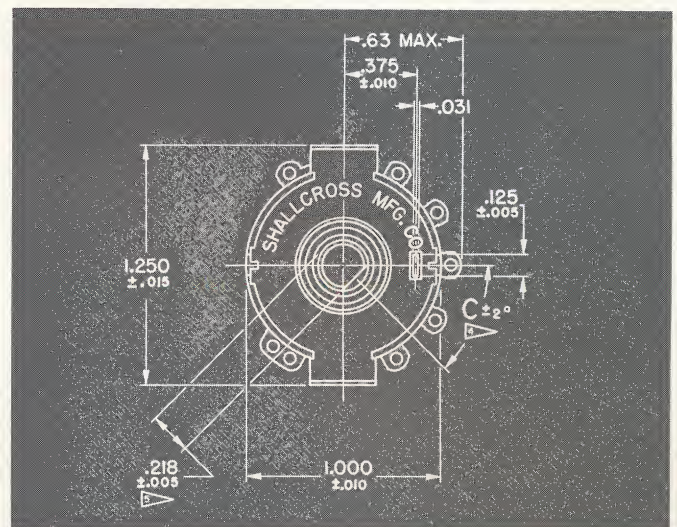
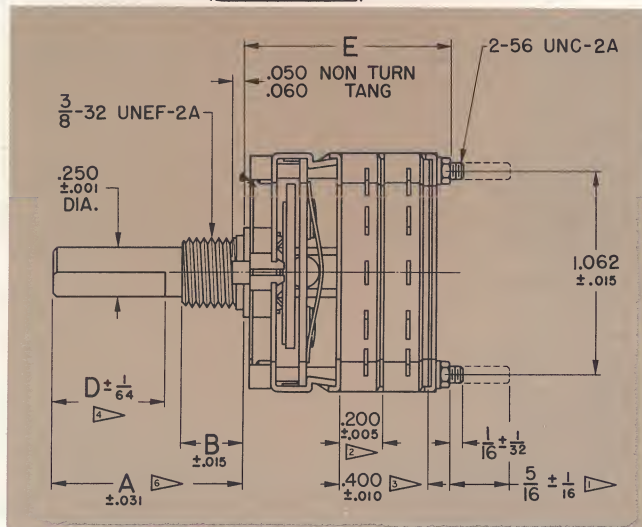


## CHECK THESE FEATURES

- (1) EXCEPTIONALLY POSITIVE, LONG LIFE INDEXING is provided by captive dual balanced balls (G) riding a coined socket detent plate (D); all passivated stainless steel construction; and a special lubricant at all frictional surfaces.
- (2) SUPERIOR CONTACT RESISTANCE VS LOAD VS LIFE RATINGS result from dual, balanced, independently sprung, silver alloy moving contacts (K) "making" each silver alloy stationary contact. The dual moving contacts provide redundant contact surfaces as well as reduced axial stress on the rotor for enhanced operational reliability.
- (3) IMPROVED CONTACT RESISTANCE AND VOLTAGE BREAKDOWN CHARACTERISTICS result from a "breaking action" that reduces "cross tracking" between contact and insulation materials.
- (4) MOVING CONTACT ALIGNMENT IS INDEPENDENT OF SHAFT AXIAL "PLAY" to reduce the possibility of accidental arm damage.
- (5) RUGGED, EXTENDED TERMINALS (N) are integral with stationary contacts to minimize structural failures. A choice of two standard terminal locations for multiwafer switches provides added wiring flexibility and ease (terminals may be located over the entire circumference of the switch or in a 180° arc at your option).
- (6) EXCEPTIONAL STOP STRENGTH is assured by the use of rugged stainless steel stops (B) stop pin supports (C and E) and stop arm (D).
- (7) DIALYL PHTHALATE, MODULAR STATORS (M) are keyed and nested for positive, accurate deck alignment (enclosed construction also provides dust protection for switch internal parts).
- (8) MOLDED IN TERMINALS eliminate resin "in-flow" on contacts during lead soldering.
- (9) EASILY ADJUSTED STOPS (B) permit field setting of positions/pole. "Snap off" plate (A) provides ready access to stops.
- (10) POSITIVE SHORTING OR NONSHORTING ACTION is assured by rugged contacts with close tolerance dimensions, spacing, and alignment.
- (11) TERMINAL LOCATIONS ARE IDENTIFIED on rear cover plate (P).
- (12) LOW THERMAL EMF CHARACTERISTICS result from the use of similar metals for all current carrying parts.
- (13) REDUCED SWITCHING NOISE AND CONTACT BOUNCE are assured by dual, smooth riding, button type, moving contacts — Low contact resistances also contribute to improved switching noise characteristics.



# SHALLCROSS SERIES 1 DIMENSIONS AND MATERIALS



- 1 Add on dimension to provide rear support accommodations for 10 or more wafers only.
- 2 See back panel dimension chart for wafers/pole and exact back panel dimension per switch type.

- 3 See back of panel dimension chart for wafers/pole and exact back panel dimension per switch type.
- 4 Flatted shafts not supplied unless specified.
- 5 Flatted shafts when specified will be cut to the standard dimension shown (optional dimensions available).

| BACK OF PANEL DIMENSION "E" VS. TOTAL NO. OF POLES |                       |                        |   |                                 |   |
|--|-----------------------|------------------------|---|---------------------------------|---|
| SWITCH TYPES                                       | TOTAL NUMBER OF POLES | TOTAL NUMBER OF WAFERS | MAXIMUM OVERALL LENGTH (Inches)                           | NOMINAL OVERALL LENGTH (Inches) | NOMINAL OVERALL LENGTH TOL. ( $\pm$ Ins.) |
|  |                       |                        |   |                                 |   |
| IJO4<br>IJO6<br>IJS4<br>IJS6                       | 1                     | 1                      | .895  |                                 |   |
|  | 2                     | 2                      | 1.100   |                                 |   |
|  | 3                     | 3                      | 1.305   |                                 |   |
|  | 4                     | 4                      | 1.510   |                                 |   |
|  | 5                     | 5                      | 1.715   |                                 |   |
|  | 6                     | 6                      | 1.920   |                                 |   |
|  | 7                     | 7                      | 2.125   |                                 |   |
|  | 8                     | 8                      | 2.330   |                                 |   |
|  | 9                     | 9                      | 2.535   |                                 |   |
|  | 10                    | 10                     | 2.740   |                                 |   |
| (2-6 positions per pole)                           | 11                    | 11                     | To obtain maximum overall length add tolerance to nominal | 2.865                           | .080                                      |
|  | 12                    | 12                     |   | 3.065                           | .085                                      |
|  | 13                    | 13                     |   | 3.265                           | .090                                      |
|  | 14                    | 14                     |   | 3.465                           | .095                                      |
|  | 15                    | 15                     |   | 3.665                           | .100                                      |
| IJO0<br>IJO2<br>IJS0<br>IJS2                       | 1                     | 2                      | 1.100   |                                 |   |
|  | 2                     | 4                      | 1.510   |                                 |   |
|  | 3                     | 6                      | 1.920   |                                 |   |
|  | 4                     | 8                      | 2.330   |                                 |   |
|  | 5                     | 10                     | 2.740   |                                 |   |
|  | 6                     | 12                     | To obtain maximum overall length add tolerance to nominal | 3.065                           | .085                                      |
|  | 7                     | 14                     |   | 3.465                           | .095                                      |
|  | 8                     | 16                     |   | 3.865                           | .105                                      |
|  | 9                     | 18                     |   | 4.265                           | .115                                      |
|  | 10                    | 20                     |   | 4.665                           | .125                                      |

| SHAFT LENGTHS (DIM. A)   |               |               |               |                |                |                |                |                |                |    |
|--|---------------|---------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----|
| Shaft lengths are measured from end of shaft to mounting surface. Standard shaft length is one inch $\pm .015$ . Optional shaft lengths from $\frac{5}{8}$ " to 2" are available. Shallcross code numbers for optional shaft lengths are as follows: |               |               |               |                |                |                |                |                |                |    |
| SHAFT LENGTH   | $\frac{5}{8}$ | $\frac{3}{4}$ | $\frac{7}{8}$ | $1\frac{1}{8}$ | $1\frac{1}{4}$ | $1\frac{3}{8}$ | $1\frac{1}{2}$ | $1\frac{5}{8}$ | $1\frac{3}{4}$ | 2  |
| SHALLX CODE  | 05            | 06            | 07            | 11             | 12             | 13             | 14             | 15             | 16             | 20 |

| STANDARD MTG. BUSHING LENGTHS |      |     |     |     |
|-------------------------------|------|-----|-----|-----|
| SHALLX TYPE                   | A    | C   | D   | E   |
| BUSHING LENGTH (DIM. B)       | 5/16 | 1/2 | 3/8 | 3/4 |

## MATERIALS

STOP RETAINER, MTG. PLATE, DETENT PARTS, COVER PLATE WASHERS, STOP PIN, SCREWS, NUTS, SHAFT, ROTOR GUIDE — stainless steel (passivated)  
 CONTACT ARMS — Beryllium copper (silver plated)  
 ROTOR CONTACTS (MOVING), STATOR CONTACTS (STATIONARY) AND INTEGRAL TERMINALS — silver alloy  
 ROTOR INSULATOR — Lexan  
 STATOR — Diallyl Phthalate (glass filled)



# SHALLCROSS

## SERIES 1

## RATINGS (COMMERCIAL)

### LOAD-LIFE RATING METHODS

All commercial load-life ratings were obtained from tests made under normal room conditions. One life cycle consisted of one full rotation both clockwise and counterclockwise.

The following criteria were established as a failure definition:

#### 1. MAXIMUM ALLOWABLE CONTACT RESISTANCE

|                |                 |
|----------------|-----------------|
| .0045 $\Omega$ | 15 VOLT AMPERES |
| .0055 $\Omega$ | 25 VOLT AMPERES |
| .006 $\Omega$  | 30 VOLT AMPERES |

2. MINIMUM ALLOWABLE VOLTAGE BREAKDOWN — 800 volts RMS (between any two active positions or to ground).

3. MINIMUM ALLOWABLE INSULATION RESISTANCE —  $10^{10}$  ohms (between any two active positions or to ground).

4. MECHANICAL FAILURE — rotational failure, arm misalignment, contact misalignment, etc. (Electrical failure preceded mechanical failure for every sample tested).

### LOAD (BREAKING) VS. LIFE (CYCLES)

| LOAD        | LIFE   |
|-------------|--------|
| NO LOAD     | 50,000 |
| 100VDC-.25A | 50,000 |
| 125VAC-.25A | 50,000 |
| 30VDC-.5A   | 50,000 |

### CURRENT CARRYING CAPACITY

10 AMPS (FOR TEMPERATURE RISE  $< 30^{\circ}\text{C}$ )

### VOLTAGE BREAKDOWN

( $-55^{\circ}\text{C}$  TO  $+85^{\circ}\text{C}$ , 50% RH, SEA LEVEL)

|                  | INITIAL (MINIMUM)      | END OF LIFE (MINIMUM) |
|------------------|------------------------|-----------------------|
| BETWEEN POLES    | 2000 V RMS (60 CYCLES) | 1500 RMS (60 CYCLES)  |
| BETWEEN CONTACTS | 1000 V RMS (60 CYCLES) | 800 RMS (60 CYCLES)   |
| TO GROUND        | 2000 V RMS (60 CYCLES) | 1500 RMS (60 CYCLES)  |

### INSULATION RESISTANCE (room conditions)

INITIAL  $> 10^{12}$

END OF LIFE  $> 10^{10}$

### THERMAL EMF

1  $\mu$  VOLT /  $^{\circ}\text{C}$  (MAXIMUM)

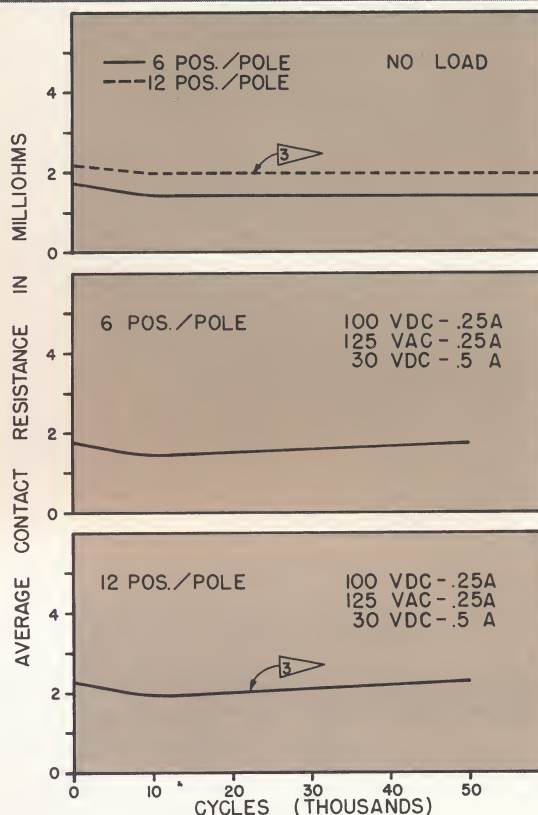
### TEMPERATURE RANGE

$-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### CAPACITANCE

| POINTS OF MEASUREMENT               | CAPACITANCE      |
|-------------------------------------|------------------|
| BETWEEN ADJACENT ACTIVE CONTACTS    | .5 uuf MAXIMUM   |
| BETWEEN CONTACT AND COMMON TERMINAL | .9 uuf MAXIMUM   |
| BETWEEN COMMON AND FRAME            | 10.0 uuf MAXIMUM |
| BETWEEN POLES                       | 5.0 uuf MAXIMUM  |

### CONTACT RESISTANCE VS LOAD VS LIFE



ON TYPES 02 & 52 CONTACT RESISTANCE IS MEASURED TO COMMON TERMINAL ON WAFER ADJACENT TO SELECTOR CONTACT. WIRE BETWEEN COMMON TERMINALS .0017 OHMS.

### CONTACT RESISTANCE

INITIAL — 6 POS/POLE — .0025  $\Omega$  MAX.  
12 POS/POLE — .0035  $\Omega$  MAX.

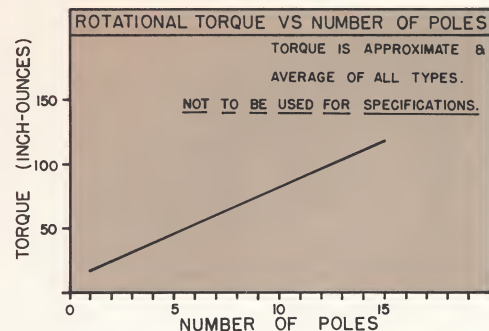
VARIATION — SEE CHARTS

### TERMINAL STRENGTH

WITHSTAND 5 LB PULL THREE MUTUALLY PERPENDICULAR PLANES

### STOP STRENGTH

WITHSTAND 25 IN/LB ROTATIONAL FORCE





# SHALLCROSS SERIES 1 SHORTING SWITCHES

**INDEXING ANGLE** — All Series 1 switch types (whether shorting or nonshorting) have 30° indexing.

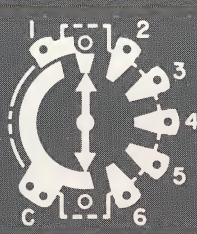
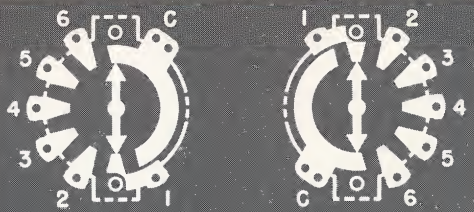
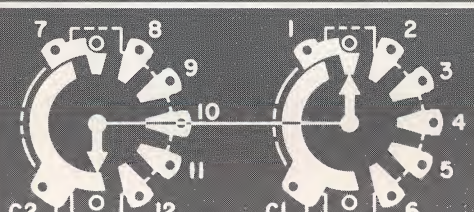
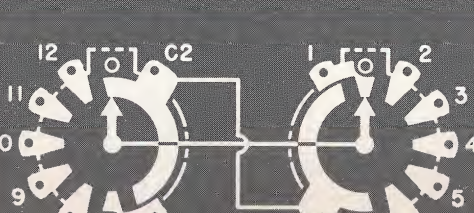



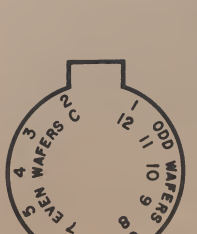
**CONTINUOUS ROTATION** — Continuous rotation operation is supplied standard only when 12 positions/pole are specified (adjustable stops are packaged separately). Six position/pole switches are provided with stops set by the factory, however, they may be converted to continuous rotation in the field by simply removing the stops. (Note that 6 position/pole switch types have 30° indexing and consequently each position will be "made" twice during a 360° rotation of the switch shaft.)

## IMPORTANT

The unique design of Series one switches necessitates a slight departure from conventional practice in determining the total number of wafers required to obtain a given number of poles. Note that switch types with 7-12 positions/pole use **two wafers for each pole** to obtain the total positions available (positions 1-6 are located on odd numbered wafers and positions 7-12 on even numbered wafers). Switch types with 1-6 available positions/pole use one wafer for each pole.

**SETTING OF POSITIONS/POLE** — Stops will be set by the factory for the positions/pole ordered excepting 12 positions/pole types which will be supplied with continuous rotation (stops are packaged separately). Stops can be easily relocated in the field to alter the positions/pole when required.

**CONNECTING COMMONS** — The factory will make any common or internal connections required to obtain the switching configuration assigned to each Series 1 switch type.


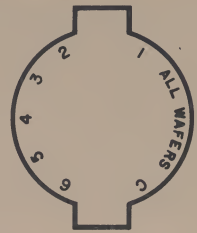
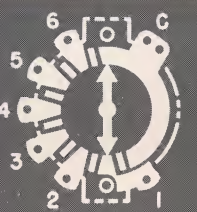
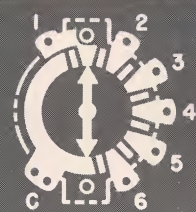
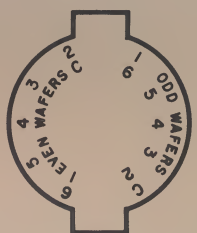
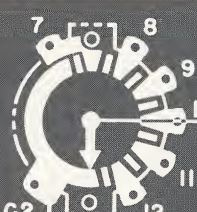

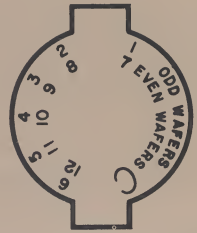
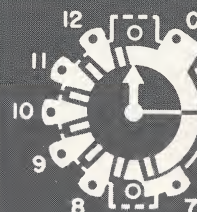

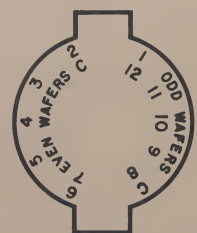
| SERIES 1 SHORTING SWITCHES  |   |                 |                  |  |
|---|---|-----------------|------------------|--|
| SHALLCROSS SERIES   | POSITIONS PER POLE  | WAFERS PER POLE | MAX. TOTAL POLES | TERMINAL LOCATIONS AND WAFER CONFIGURATIONS VIEWED FROM MTG. PLATE WITH MOVING CONTACT IN #1 POSITION AND MTG. TANG AT 90° (3 O'CLOCK) |
| 1J04  | 2-6   | 1               | 20               |  <p>EVEN AND ODD WAFERS</p>                           |
| 1J06  | Type 1J06 is identical to type 1J04 except alternate wafers are rotated 180° to provide an optional terminal location arrangement (see wafer configuration drawings for these 2 types). |                 |                  |  <p>EVEN WAFERS      ODD WAFERS</p>                 |
| 1J00  | 2-12  | 2               | 10               |  <p>EVEN WAFERS      ODD WAFERS</p>                |
| 1J02  | Type 1J02 is identical to type 1J00 except alternate wafers are rotated 180° to provide an optional terminal location arrangement (See wafer configuration drawings for these 2 types). |                 |                  |  <p>EVEN WAFERS      ODD WAFERS</p>                |
| REAR COVER PLATE WITH TERMINAL LOCATION MARKINGS FOR EACH SWITCH TYPE                 |   |                 |                  |  |
|    |   |                 |                  |  |
|   |   |                 |                  |  |
|  |   |                 |                  |  |
|  |   |                 |                  |  |

Lines between arrows show internal connection between rotor contacts. They are not connected to stator contacts.



# SHALLCROSS SERIES 1 NONSHORTING SWITCHES

## SERIES 1 NONSHORTING SWITCHES

| SHALLCROSS SERIES | POSITIONS PER POLE  | WAFERS PER POLE | MAX. TOTAL POLES | TERMINAL LOCATIONS AND WAFER CONFIGURATIONS VIEWED FROM MTG. PLATE WITH MOVING CONTACT IN #1 POSITION AND MTG. TANG AT 90° (3 O'CLOCK)  | REAR COVER PLATE WITH TERMINAL LOCATION MARKINGS FOR EACH SWITCH TYPE                 |
|-------------------|---|-----------------|------------------|---|---|
| 1J54              | 2-6   | 1               | 20               |  <p>EVEN AND ODD WAFERS</p>  |    |
| 1J56              | Type 1J56 is identical to type 1J54 (above) except alternate wafers are rotated 180° to provide an optional terminal location arrangement (see wafer configuration drawings for these 2 types). |                 |                  |  <p>EVEN WAFERS</p>  <p>ODD WAFERS</p>     |    |
| 1J50              | 2-12  | 2               | 10               |  <p>EVEN WAFERS</p>  <p>ODD WAFERS</p>   |   |
| 1J52              | Type 1J52 is identical to type 1J50 (above) except alternate wafers are rotated 180° to provide an optional terminal location arrangement (see wafer configuration drawings for these 2 types). |                 |                  |  <p>EVEN WAFERS</p>  <p>ODD WAFERS</p> |  |

Lines between arrows show internal connection between rotor contacts. They are not connected to stator contacts.

## SERIES 1 ORDER CODE

| I  | J   | 50  | A  | 12                 | —    | 4                     | —    | K   | 12  | M  |
|--|---|---|--|--------------------|------|-----------------------|------|---|---|--|
| SERIES ONE                                 | INDEX ANGLE   | WAFER CONFIGURATION                         | SHALLCROSS MOUNTING TYPE   | POSITIONS PER POLE | DASH | TOTAL NUMBER OF POLES | DASH | GOLD PLATING  | OPTIONAL SHAFT LENGTH   | CUSTOMER MARKING   |
|  | SELECT WAFER CONFIGURATION THAT PROVIDES PREFERRED SWITCHING ACTION (SHORTING OR NONSHORT-ING) MAX. POS/POLE AND TERMINAL LOCATIONS | SELECT FROM AVAILABLE BUSHING LENGTHS CHART | NUMBER OF POSITIONS PER POLE AND TOTAL NUMBER OF POLES ARE NOT TO EXCEED THE MAXIMUM AVAILABLE FOR SWITCH TYPE ORDERED |                    |      |                       |      | ADD LETTER K IF GOLD PLATED CURRENT CARRYING PARTS ARE REQUIRED | FOR LENGTHS OTHER THAN STANDARD 1" ADD APPROPRIATE CODE FROM SHAFT LENGTH CHART | ADD LETTER M IF YOUR PART NUMBER IS TO BE MARKED ON MOUNTING PLATE |
|  |   |   |  |                    |      |                       |      |   |   |  |
|  |   |   |  |                    |      |                       |      |   |   |  |
| STANDARD OPTION CODE                       |   |   |  |                    |      |                       |      |   |   |  |
| OMIT CODE NUMBERS FOR OPTIONS NOT REQUIRED |   |   |  |                    |      |                       |      |   |   |  |

## SPECIFICATION SHEETS

Series 1 Specification Sheet #5 can be used to conveniently create your own control drawings when required. See pages 24 and 25.





shallcross

SERIES 2

ROTARY SWITCH LINE

THE INDUSTRIES' TOP VALUE 1¾" QUALITY ROTARY SWITCH LINE (cost vs electromechanical performance and reliability)

MEET THE REQUIREMENTS OF MIL-S-3786 styles SR14-1 and SR14-2

EXCEPTIONAL CONTACT RESISTANCE VS. LOAD VS LIFE RATINGS

## FEATURES

RUGGED STOPS, SWITCH DECKS, DETENTS AND TERMINALS (easily wired)

24 OR 32-POSITIVE DECKS AND UP TO 20 POLES/SWITCH

CONSERVATIVE, DEFINITIVE RATINGS THAT REFLECT OUTSTANDING ELECTROMECHANICAL PERFORMANCE

## MECHANICAL DETAILS

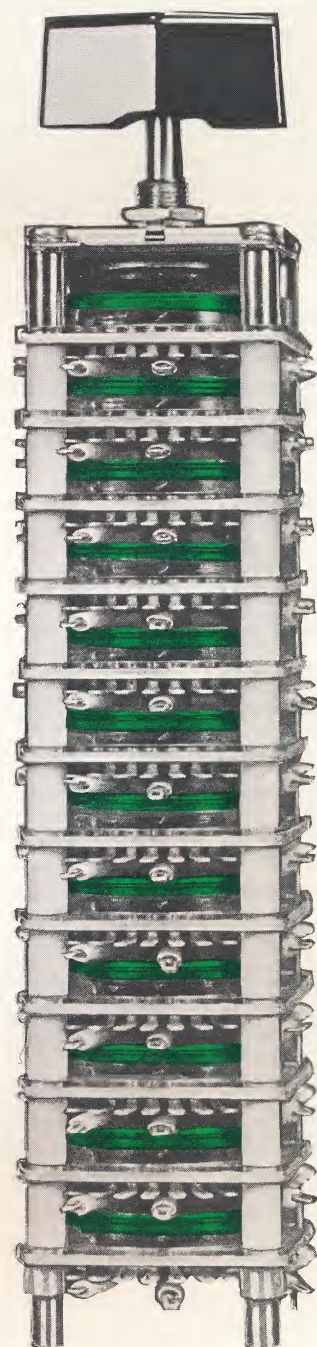
**ADJUSTABLE STOPS**— Stops are set at the factory to provide the number of positions ordered. Continuous rotation switches (single pole/deck only) are supplied with separate stops in their shipping containers. To alter the number of positions available per pole, turn the shaft completely CCW, remove mounting plate screws (A), mounting plate (B), stop pin retainer (C), and relocate one stop pin (D) to provide the total rotation required. The stop pin adjacent to the lanced finger on ball retainer plate (F) remains fixed. Make certain that stop pin retainers (C) and mounting plate (B) are reassembled in their original positions (retainer is keyed to mounting plate tang hole which in turn must be located on the same side of switch as identification notch on switch deck). On multiple/deck switches do not locate stops beyond the maximum positions/pole available for that switch type and do not rotate the shaft until the switch has been re-assembled.

**DETENT ASSEMBLY**— Balanced dual captive balls (G) riding a hill and dale type detent plate (E) are retained by plate (F) and spring (H). The special ball, detent plate, and ball retainer plate configurations plus precision tolerance parts, provide exceptionally positive and durable detenting when compared to conventional designs.

**DUST COVER (Optional)**— Translucent plastic dust cover (J) is available for the dust protection of all switch contact, contact arm, and collector segment contact surfaces. The addition of these covers does not alter the back panel or OD dimensions of the standard switch (special rotors and deck spacers (I) are provided to maintain these dimensions).

**ARMS AND ROTORS**— Dual, silver contact arms (L) with completely independent spring members, canted contacting surfaces, and rotor attachments provide exceptionally low contact resistance. The unique arm configuration also provides self-wiping action and constant tension on all contacts to assure contact resistance stability. The plastic (diallyl phthalate) rotors (K) accept up to 4 contact arm sets to provide 1, 2, 3 or 4 pole/deck operation as required.

**DECK ASSEMBLY**— Silver contacts with special shanks staked into a glass fibre reinforced epoxy stator (N) are flatted, pierced and flared to provide integral terminal lugs and contacts (O) for minimum contact to terminal resistance and maximum reliability. Silver collector rings are staked to the stator and soldered directly to the common terminals to reduce the number of connection points. "Pressed in" nylon bushings (P) and rotor spacers (M) positively position the rotor and reduce frictional drag. A rotor spring (R) between the shaft and rotor locks them together to eliminate backlash during rotation.



MECHANICAL  
DETAILS CONT. ON PAGE 14



## TYPES A, C, D AND E BUSHING MTG. (ACTUAL SIZE)

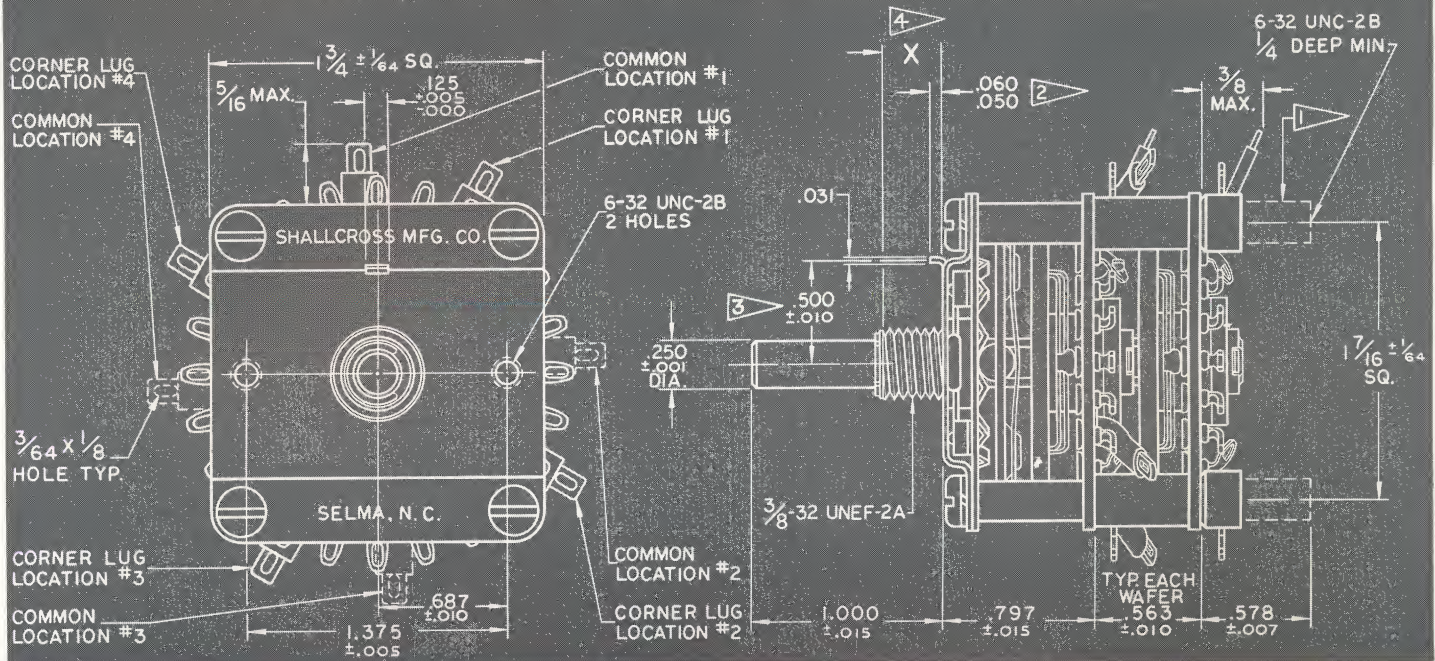


DIAGRAM 1

DIAGRAM 2

▷ Rear support spacers supplied on 6 decks or more.  
 ▷ Standard tang length as shown (.120/.110 tang length available.)

▷ Standard tang location as shown (.531" dimension optional with .050/.060 tang length.)  
 ▷ See standard mtg. bushing lengths chart below for available bushing sizes.

## COMMON AND CORNER TERMINAL LOCATIONS

| SWITCH TYPE      | TERMINAL LOCATIONS FROM DIAGRAM 1 |                  |
|------------------|-----------------------------------|------------------|
|                  | COMMON TERMINALS                  | CORNER TERMINALS |
| 1 POLE PER DECK  | 2J50                              | #1               |
|                  | 2J00                              | #1               |
|                  | 2H50                              | #1               |
|                  | 2H00                              | #1               |
|                  | 2E00                              | #1               |
|                  | 2C00                              | #1               |
| 2 POLES PER DECK | 2J56                              | #1 & #3          |
|                  | 2J06                              | #1 & #3          |
|                  | 2H56                              | #1 & #3          |
|                  | 2H06                              | #1 & #3          |
|                  | 2E06                              | #1 & #3          |
|                  | 2C06                              | #1 & #3          |
| 3 POLES PER DECK | 2J62                              | #1, #2 & #3      |
|                  | 2J12                              | #1, #2 & #3      |
|                  | 2H62                              | #1, #2 & #3      |
|                  | 2H12                              | #1, #2 & #3      |
|                  | 2E12                              | #1, #2 & #3      |
|                  | 2C12                              | #1, #2 & #3      |
| 4 POLES PER DECK | 2J68                              | ALL FOUR         |
|                  | 2J18                              | ALL FOUR         |
|                  | 2H68                              | ALL FOUR         |
|                  | 2H18                              | ALL FOUR         |
|                  | 2E18                              | ALL FOUR         |
|                  | 2C18                              | ALL FOUR         |

DECK CONFIGURATION DRAWINGS FOR ALL  
 SHALLCROSS SERIES 2 SWITCH TYPES ON PAGES 19-20-21

## STANDARD MTG. BUSHING LENGTHS

| SHALLX TYPE | BUSHING LENGTH (DIM.X) |
|-------------|------------------------|
| A           | 5/16"                  |
| B           | NO BUSHING             |
| C           | 1/2"                   |
| D           | 3/8"                   |
| E           | 3/4"                   |

ALL BUSHINGS ARE  
 3/8-32 UNEF-2A

## SHAFT LENGTHS

Shaft lengths are measured from end of shaft to mounting surface. Standard shaft length is one inch  $\pm .015$ . Optional shaft lengths from 5/8" to 2" are available. Shallcross code numbers for optional shaft lengths are as follows:

| SHAFT LENGTH | 5/8 | 3/4 | 7/8 | 1 1/8 | 1 1/4 | 1 3/8 | 1 1/2 | 1 5/8 | 1 3/4 | 2  |
|--------------|-----|-----|-----|-------|-------|-------|-------|-------|-------|----|
| SHALLX CODE  | 05  | 06  | 07  | 11    | 12    | 13    | 14    | 15    | 16    | 20 |



# TYPE B

# 2 HOLE MTG. (ACTUAL SIZE)

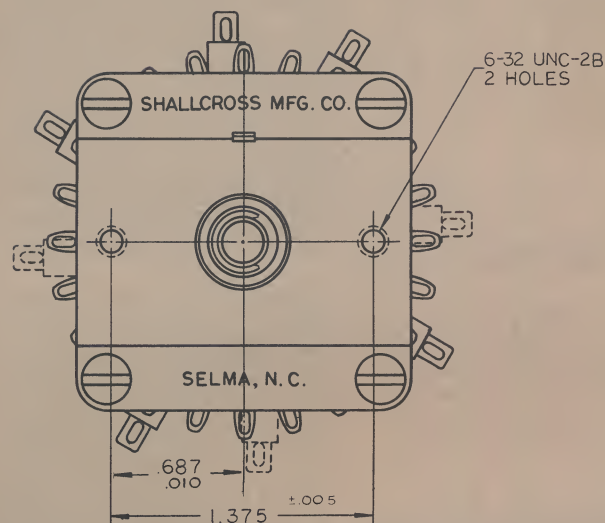


DIAGRAM 3

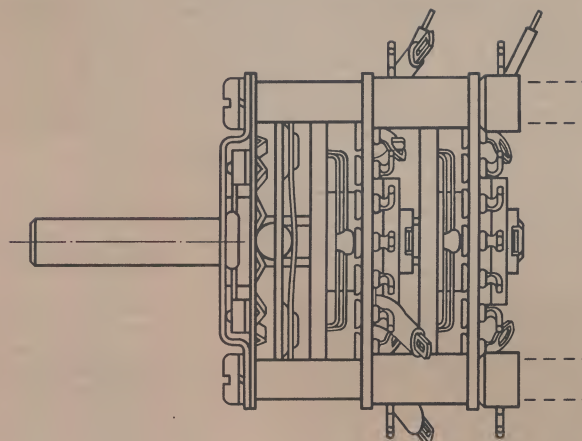


DIAGRAM 4

All dimensions identical to types A, C, D, E bushing mtg. types except bushing omitted.

## MATERIALS

**DETENT SPRING AND BALLS, SHAFT, MTG. PLATE, STOPS, BUSHING, MTG. HARDWARE, DETENT PLATE, BALL RETAINER**—passivated stainless steel

**WIPER ARMS**—solid spring silver alloy (gold plate optional)

**CONTACTS, COLLECTOR RINGS, (SEGMENTS)**—solid silver alloy (gold plate optional)

**STATOR (deck plate)**—epoxy fiberglass

**CONTACT LUGS**—(integral with contacts) solid silver alloy

**COMMON AND CORNER TERMINALS**—copper alloy (tin dipped and teflon sleeve insulated)

**ROTOR BEARING, ROTOR SPACERS, INSULATING CUPS**—nylon

**ROTOR**—diallyl — phthalate (glass fibre reinforced)

**STOP PIN RETAINER**—nickel silver

**SCREWS, STUDS AND DETENT SPACERS**—nickel plated brass

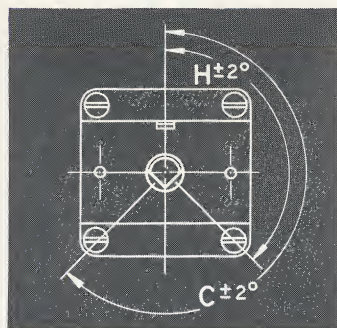
**DECK SPACERS**—steatite

ALL MATERIALS SUBJECT TO CHANGE WITHOUT NOTICE

## BACK OF PANEL DIMENSIONS VS. NUMBER OF DECKS

| NUMBER OF DECKS | MAX. OVERALL LENGTH (Inches)                              | NOMINAL OVERALL LENGTH (Inches) | NOMINAL OVERALL LENGTH TOLERANCE (± Ins.) |                              |
|-----------------|---|---------------------------------|---|------------------------------|
| 1               | 1.187   |                                 |   | Without rear support spacers |
| 2               | 1.760   |                                 |   |                              |
| 3               | 2.333   |                                 |   |                              |
| 4               | 2.906   |                                 |   |                              |
| 5               | 3.479   |                                 |   |                              |
| 6               | To obtain maximum overall length add tolerance to nominal | 4.190                           | .072                                      | With rear support spacers    |
| 7               |   | 4.753                           | .082                                      |                              |
| 8               |   | 5.316                           | .092                                      |                              |
| 9               |   | 5.879                           | .102                                      |                              |
| 10              |   | 6.442                           | .112                                      |                              |
| 11              |   | 7.005                           | .122                                      |                              |
| 12              |   | 7.568                           | .132                                      |                              |
| 13              |   | 8.131                           | .142                                      |                              |
| 14              |   | 8.694                           | .152                                      |                              |
| 15              |   | 9.257                           | .162                                      |                              |
| 16              |   | 9.820                           | .172                                      |                              |
| 17              |   | 10.383                          | .182                                      |                              |
| 18              |   | 10.946                          | .192                                      |                              |
| 19              |   | 11.509                          | .202                                      |                              |
| 20              |   | 12.072                          | .212                                      |                              |

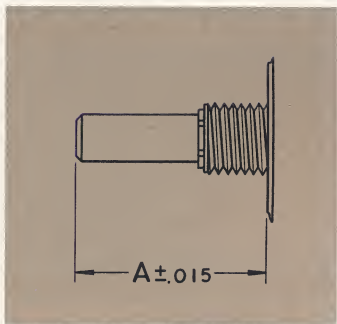




(FIG. 1)

## FLAT LOCATION (Figure 1)

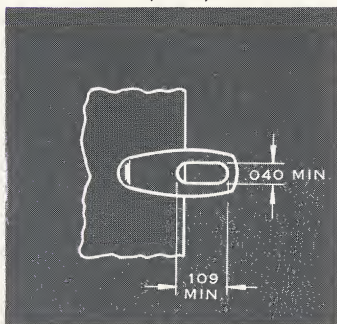
Flat angle C is determined with the switch rotated fully CCW or to the #1 position if no stops are provided (see locating #1 position below). Angle H is used only if knobs with two set screws are required. Angle C is determined by a line drawn through the shaft center and the mounting tang (or mounting tang hole if the tang is not used) and a line perpendicular to the shaft flat. The standard flat angle tolerance is  $\pm 2^\circ$ . Shaft flats are not supplied unless requested.



(FIG. 2)

## SHAFT LENGTH (Figure 2)

Measurement of shaft length is always made from front of shaft to the mounting surface (dimension A). The standard shaft length is one inch (optional lengths are available) and the standard dimensional tolerance is  $\pm .015$ ".



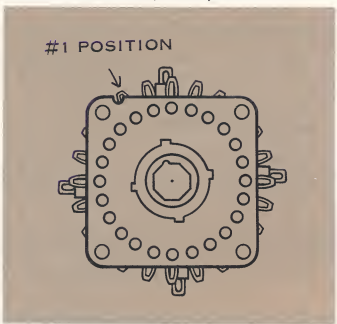
(FIG. 3)

## LUG DETAILS (Figure 3)

Standard terminal lug hole dimensions are as shown in Figure 3 (To accept a maximum of 2 #20 wire leads). The lugs are integral with contacts to assure maximum reliability and provide terminal strength ratings in excess of all military and commercial standards. All terminals are flared to promote accessibility and wiring ease.

## LOCATING COMMON AND #1 POSITIONS (Figure 4)

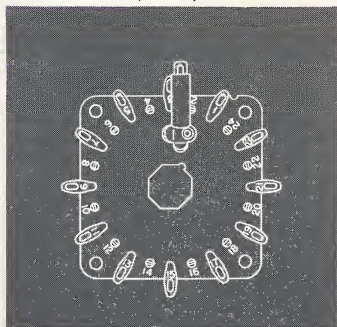
The #1 lug position is located directly behind the notch provided for that purpose on each deck plate (Figure 4). Common terminals are identified by red teflon sleeving. The positions for all terminals (including commons) are located by using the deck configuration drawing for the appropriate switch type (see Shallcross spec. sheets #1 and #2 or pages 19-20-21 and diagram 1 page 6 of this catalog).



(FIG. 4)

## CONTACT MARKING (Figure 5)

MIL-S-3786 switches (style SR14) require contact marking as shown in Figure 5 at left. Standard commercial switches are not marked unless specified (at additional charge).



(FIG. 5)

# RECOMMENDED MOUNTING AND WIRING PROCEDURES

## PANEL MOUNTING

Panel holes for bushing mounted switches should be  $.380" \pm .005"$ . Oversized panel holes may result in switch damage if mounting nuts are overtightened. Switches which will have dials on the panel should use the minimum panel hole dimension to avoid dial misalignment.

## REAR MOUNTING SUPPORTS

Series 2 switches with more than five decks should use a rear mounting bracket (provisions for mounting rear brackets are standard but brackets themselves are not supplied except on special order). The mounting procedure for switches having more than 20 decks should be cleared by the Shallcross Engineering Department.

## WIRING

Wiring procedures consistent with the best established standards for harnessing miniature electronic components must be used. A 60-80 watt soldering iron and a maximum soldering time of 3 seconds are recommended to avoid damage to switch contacts. Care should be taken to avoid depositing extraneous materials (solder, flux, wire strands and wire insulation particles) on switch decks, arms and contacts.



# MIL-S-3786 STYLE SR14 SPECIFICATIONS

## FOREWORD:

Shallcross Series 2 rotary switches meet all requirements of MIL-S-3786 style SR14. In conjunction with General Time solenoid equipment they, also, exceed all requirements of style SR16 of the same specification. A portion of the operating specifications and general requirements for style SR14 have been extracted or condensed and provided below.

## GENERAL

Switches, Rotary (Circuit Selector, Low Capacity).

## DESIGN AND CONSTRUCTION

All switches shall be of the design construction and physical dimensions shown in style SR14 MIL-S-3786

## ROTATIONAL LIFE

The temperature — life characteristics shall be test-condition letter C except that the electrical rotational life of the switch shall be 50,000 cycles (proposed test condition E). After life (rotational) the torque shall change not more than 35 percent of its initial value. A cycle shall consist of 360 degrees minus the degrees in one throw in a clockwise direction and an equal number of degrees in a counterclockwise direction. The test loads for the applicable circuit conditions shall be as shown in Table V.

TABLE V — CIRCUIT VALUES FOR LIFE (ROTATIONAL) TEST

|                         | Inductive load (2.8 henries) |            | Resistive loads (a.c. or d.c.) |       |
|-------------------------|------------------------------|------------|--------------------------------|-------|
|                         | Milliamperes                 | Volts d.c. | Milliamperes                   | Volts |
| At atmospheric pressure | 50                           | 30         | 500                            | 30    |
|                         |                              |            | 50                             | 300   |

## ROTATIONAL TORQUE

The minimum and maximum values of torque determined for shaft rotation shall be within the limits shown in Table IV.

TABLE IV — ROTATIONAL — TORQUE LIMITS

| Temperature    | Torque (lb-in.) |                              |                            |
|----------------|-----------------|------------------------------|----------------------------|
|                | Minimum         | Up to 5 sections or 10 poles | Up to 10 decks or 15 poles |
|                |                 | Maximum                      | Maximum                    |
| Room<br>— 65°C | 1½              | 6                            | 10                         |
|                | 1½              | 8                            | 13                         |

## CONTACT RESISTANCE

Contact resistance shall not exceed the following values:

|  |              |
|--|--------------|
| Initial and after vibration and shock .....    | 5 milliohms  |
| After moisture-resistance and salt spray ..... | 5 milliohms  |
| After life (rotational) tests .....            | 10 milliohms |

## TORQUE (stops)

Single shaft switches containing stops shall withstand a torque of 50 pound-inches applied to the shaft against the stops in clockwise and counterclockwise directions.

## INSULATION RESISTANCE

Per MIL-S-3786

VOLTAGE BREAKDOWN(at atmospheric pressure) INITIAL — 1500 volts RMS

END OF LIFE — 1000 volts RMS

## TEMPERATURE RANGE

— 65°C to +125°C

## VIBRATION

10-2000 cps per MIL-S-3786

## SALT SPRAY

48 hours per MIL-S-3786

## SHOCK

High impact per MIL-S-3786

## THERMAL SHOCK

Per MIL-S-3786



## ELECTRICAL RATINGS

| LOAD (BREAKING) VS. LIFE (CYCLES) |         |
|-----------------------------------|---------|
| LOAD                              | LIFE    |
| 0 VDC, 0 AMPS                     | 100,000 |
| 10 VDC, 10.0 AMPS                 | 25,000  |
| 30 VDC, 4.0 AMPS                  | 10,000  |
| 30 VDC, 2.0 AMPS                  | 20,000  |
| 30 VDC, 1.0 AMP                   | 50,000  |
| 100 VDC, 0.5 AMP                  | 20,000  |
| 100 VDC, 0.25 AMP                 | 25,000  |
| 250 VDC, 0.1 AMP                  | 50,000  |
| 300 VDC, 0.05 AMP                 | 50,000  |
| 120 VAC, 2.0 AMPS                 | 10,000  |
| 10 VDC, 5.0 AMPS                  | 40,000  |
| 120 VAC, 0.5 AMP                  | 30,000  |

## LOAD-LIFE RATING METHODS

All commercial load-life ratings were obtained from tests made under normal room conditions. One life cycle consisted of one full rotation both clockwise and counterclockwise.

The following criteria were established as a failure definition:

## 1. MAXIMUM ALLOWABLE CONTACT RESISTANCE (ANY CONTACT)

| MAXIMUM CONTACT RESISTANCE | APPLIED LOADS (TO AND INCLUDING) |
|----------------------------|----------------------------------|
| .004 $\Omega$              | 30 VOLT AMPERES                  |
| .006 $\Omega$              | 50 VOLT AMPERES                  |
| .01 $\Omega$               | 240 VOLT AMPERES                 |

## 2. MINIMUM ALLOWABLE VOLTAGE BREAKDOWN —

800 volts RMS (between any two active positions or to ground).

## 3. MINIMUM ALLOWABLE INSULATION RESISTANCE —

10<sup>12</sup> ohms (between any two active positions or to ground).

## 4. MECHANICAL FAILURE —

rotational failure, arm misalignment, contact misalignment, etc., (Electrical failure preceded mechanical failure for every sample tested).

ELECTRICAL RATINGS (CONTINUED)  
CAPACITANCE

## POINTS OF MEASUREMENT

BETWEEN ADJACENT ACTIVE CONTACTS

BETWEEN CONTACT AND COMMON

BETWEEN COMMON AND FRAME

BETWEEN POLES (2 POLES/DECK)

BETWEEN POLES (3 &amp; 4 POLES/DECK)

**CONTACT RESISTANCE**  
INITIAL — .002 OHMS MAXIMUM  
VARIATION — SEE CHART

## ENVIRONMENTAL

**TEMPERATURE RANGE**  
—40°C to +85°C (WHERE  
RATINGS ARE TO BE MET)  
—65°C to +125°C (WHERE  
DERATED)

## MECHANICAL

**STOP STRENGTH**  
WITHSTAND 50 IN/LB ROTATIONAL  
**TERMINAL STRENGTH**  
WITHSTAND 5 LB PULL TENSILE  
PERPENDICULAR PLANES  
**ROTATIONAL TORQUE**

## CURRENT CARRYING CAPACITY

10 AMPS (FOR TEMPERATURE RISE  $\leq 30^{\circ}\text{C}$ )

## VOLTAGE BREAKDOWN

(—55°C TO +85°C, 50% RH, SEA LEVEL)

|                  | INITIAL (MINIMUM)      | END OF LIFE (MINIMUM) |
|------------------|------------------------|-----------------------|
| BETWEEN POLES    | 2000 V RMS (60 CYCLES) | 1000V RMS (60 CYCLES) |
| BETWEEN CONTACTS | 1500 V RMS (60 CYCLES) | 800V RMS (60 CYCLES)  |
| TO GROUND        | 3000 V RMS (60 CYCLES) | 2000V RMS (60 CYCLES) |
| BETWEEN DECKS    | 6000 V RMS (60 CYCLES) | 4000V RMS (60 CYCLES) |

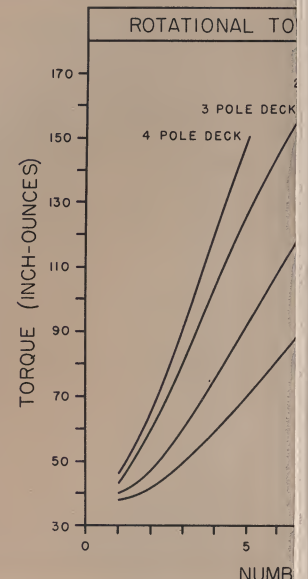
## INSULATION RESISTANCE (room conditions)

INITIAL  $> 10^{14}$

END OF LIFE  $> 10^{12}$

## THERMAL EMF

1  $\mu$  VOLT /°C (MAXIMUM)





# INGS (COMMERCIAL)

UED)

| MENT     | CAPACITANCE         |
|----------|---------------------|
| TS       | .7 $\mu$ f MAXIMUM  |
| TERMINAL | .7 $\mu$ f MAXIMUM  |
|          | 5.0 $\mu$ f MAXIMUM |
|          | 2.0 $\mu$ f MAXIMUM |
| CK )     | 1.5 $\mu$ f MAXIMUM |

MAXIMUM  
S 101-105

## ENTAL RATINGS

E ALL OTHER COMMERCIAL  
)  
RE LIFE RATINGS CAN BE

## CAL RATINGS

TATIONAL FORCE (MINIMUM)

THREE MUTUALLY

### TORQUE VS. NUMBER OF DECKS

POLE DECK  
1 POLE DECK



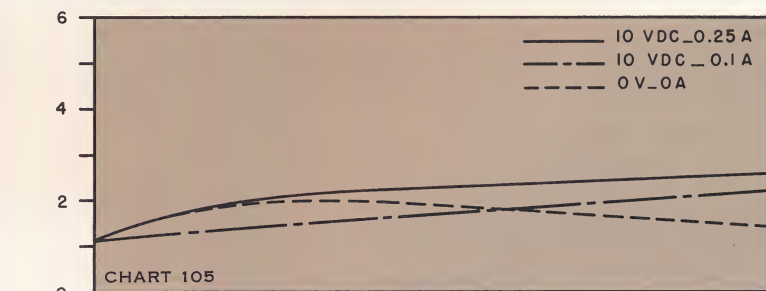
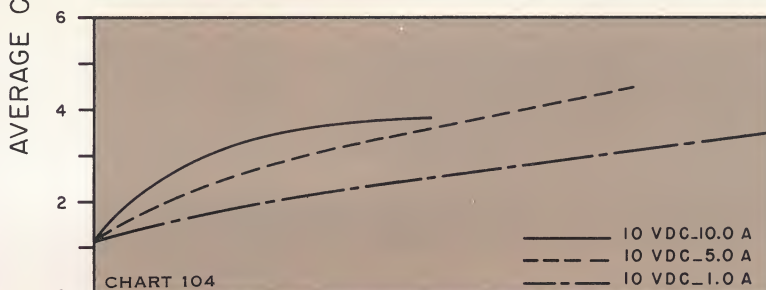
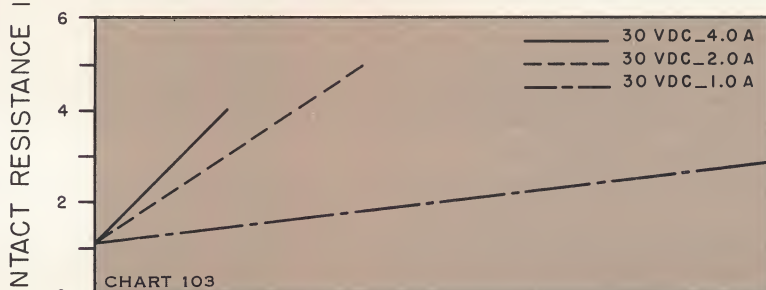
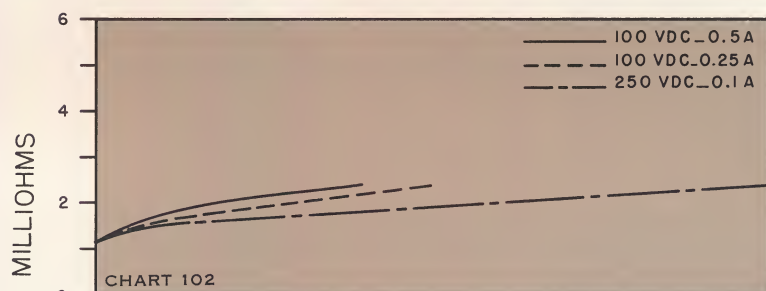
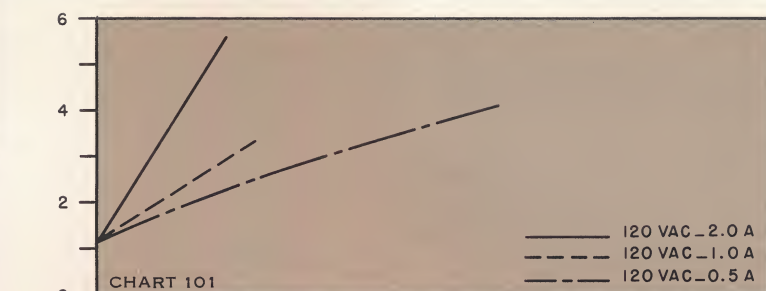
TORQUE IS APPROXIMATE &  
AVERAGE OF ALL TYPES.

NOT TO BE USED FOR SPECIFICATIONS.

10 15

R OF DECKS

### CONTACT RESISTANCE VS. LOAD VS. LIFE



CYCLES (THOUSANDS)



## SERIES 1, 2 OR 4 ORDERING INFORMATION

## ORDERING CODE

**FOREWORD**—The Shallcross switch order code system and/or reproducible specification sheets provide an exceptionally convenient and "error free" ordering method for Series 1, Series 2 or Series 4 rotary switches. The order code is sufficient for standard switch requirements not requiring a master drawing. The dual purpose specification sheets provide reproducible control drawings for your records as well as specification sheets for quotations or ordering.

The part number system presented in the chart below permits the ordering of any standard Series 2, Series 4, or Series 1 rotary switch (and most standard options). Switch types and options that cannot be specified using this code will be assigned special part numbers (see "ordering specials").

| SAMPLE ORDERING CODE  |   |   |                  |   |      |                       |      |  |   |  |   |
|---|---|---|------------------|---|------|-----------------------|------|--|---|--|---|
| STANDARD SWITCH CODE  |   |   |                  |   |      | STANDARD OPTION CODE  |      |  |   |  |   |
| 2   | J   | 50  | A                | 12  | —    | 4                     | —    | D  | K   | 12   | M   |
| SERIES<br>NUMBER  | INDEXING<br>ANGLE   | DECK<br>CONFIGURATION   | MOUNTING<br>TYPE | POSITIONS<br>PER POLE   | DASH | NUMBER<br>OF<br>DECKS | DASH | DUST<br>COVERS   | GOLD<br>PLATING   | OPTIONAL<br>SHAFT<br>LENGTHS   | CUSTOMER<br>MARKING   |
| Series<br>2<br>(1¾")<br>Rotary<br>Switches<br>(Insert<br>4 or 1<br>for Series<br>4 and 1<br>switches<br>respect<br>ively) | Select<br>Your Preferred<br>Switch Type From<br><br><b>ORDER CHARTS<br/>SUPPLIED FOR EACH<br/>SWITCH SERIES</b> | From<br>Chart<br>2<br>Page<br>6<br>(Series 2)<br>or<br>Chart 4<br>Page 21<br>(Series 4) |                  | Make Certain Number Of<br>Positions Per Pole And<br>Number Of Decks Do<br>Not Exceed Maximum<br>Available For Switch<br>Type Ordered. |      |                       |      | Add<br>Letter<br>D<br>If<br>Dust<br>Covers<br>Are<br>Required<br>See<br>Page<br>16<br>(Series 2<br>Only) | Add<br>Letter<br>K<br>If<br>Gold<br>Plated<br>Current<br>Carrying<br>Parts Are<br>Required<br>See<br>Page<br>17 | For<br>Shaft<br>Lengths<br>Other<br>Than<br>Standard<br>1"<br>Length<br>Add<br>Appropriate<br>Code<br>Number<br>From<br>Chart 3<br>Page<br>6 | Add<br>Letter<br>M<br>If Your<br>Part<br>Number<br>As Well As<br>Shallcross<br>Part<br>Number<br>Is To Be<br>Marked On<br>Switch<br>Mounting<br>Plate |
| Omit Code Numbers For Standard<br>Options Not Required  |   |   |                  |   |      |                       |      |  |   |  |   |

## ORDERING SPECIALS

Special switches and/or standard options that cannot be specified using the part number system above (flat-ted shafts, cluster arms, dual-concentric shafts, special wiring, etc.) will be assigned a code number by the factory. Provide the part number for your preferred basic switch type and either a Shallcross specification sheet (below) or your own written specifications for the deviations needed. A suffix four digit code will be added to the base switch part number to define these deviations. The complete part number must be used for any subsequent orders.

## EXAMPLE SPECIAL CODE NUMBER

2J50A12-5

Basic  
Switch  
Type

X60N

Special  
Code

## SPECIFICATION SHEETS

SHALLCROSS [SERIES 2] ROTARY SWITCH SPECIFICATION SHEET #2 (MIL-S-3706 STYLE SR14)

**ELECTRICAL RATINGS (MIL-S-3706 STYLE SR14)**

POWER (50,000 cycles rotational life at +125°C)  
100W — 1000 rpm  
50W — 1000 rpm  
25W — 1000 rpm  
10W — 1000 rpm  
5W — 1000 rpm  
2.5W — 1000 rpm  
1W — 1000 rpm  
0.5W — 1000 rpm  
0.25W — 1000 rpm  
0.1W — 1000 rpm

**MECHANICAL RATINGS**

STOP STRENGTH  
ROTATIONAL TORQUE LIMITS

**ENVIRONMENTAL RATINGS**

TEMPERATURE RANGE — 55°C to +125°C

Series 2 specification sheets #1 and #2, Series 4 sheets #3 and #4 and Series 1 sheet #5 are provided to eliminate format and technical errors in creating reproducible control drawings for your records, when needed. Copies of all sheets are included with this catalog (additional copies are available on request). Step by step instructions for completion of these sheets are furnished on pages 18 and 19.



# SHALLCROSS SERIES 2 NONSHORTING SWITCHES

|                                     | SHALLCROSS<br>SERIES | INDEXING<br>ANGLE       | MAXIMUM<br>POSITIONS<br>PER POLE<br>WITH STOPS | MAXIMUM<br>POSITIONS<br>PER POLE,<br>NO STOPS | MAXIMUM<br>DECKS | DECK<br>CONFIGURATION<br>(VIEWED FROM MOUNTING PLATE) |
|-------------------------------------|----------------------|-------------------------|--|---|------------------|---|
| <b>1<br/>POLE<br/>PER<br/>DECK</b>  | 2H50                 | $22\frac{1}{2}^{\circ}$ | 16   | 16  | 20               |   |
|                                     | 2J50                 | $30^{\circ}$            | 12   | 12  | 20               |   |
| <b>2<br/>POLES<br/>PER<br/>DECK</b> | 2H56                 | $22\frac{1}{2}^{\circ}$ | 8  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 12               |   |
|                                     | 2J56                 | $30^{\circ}$            | 6  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 12               |   |
| <b>3<br/>POLES<br/>PER<br/>DECK</b> | 2H62                 | $22\frac{1}{2}^{\circ}$ | 4  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 8                |   |
|                                     | 2J62                 | $30^{\circ}$            | 3  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 8                |   |
| <b>4<br/>POLES<br/>PER<br/>DECK</b> | 2H68                 | $22\frac{1}{2}^{\circ}$ | 4  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 6                |   |
|                                     | 2J68                 | $30^{\circ}$            | 3  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 6                |   |



# SHALLCROSS SERIES 2 SHORTING SWITCHES

| 1<br>POLE<br>PER<br>DECK  | SHALLCROSS<br>SERIES   | INDEXING<br>ANGLE | MAXIMUM<br>POSITIONS<br>PER POLE<br>WITH STOPS | MAXIMUM<br>POSITIONS<br>PER POLE,<br>NO STOPS | MAXIMUM<br>DECKS | DECK<br>CONFIGURATION<br>(VIEWED FROM MOUNTING PLATE) |
|---------------------------|--|-------------------|--|---|------------------|---|
|                           | 2C00   | 11¼°              | 31   | 32  | 20               |   |
|                           | 2E00   | 15°               | 23   | 24  | 20               |   |
|                           | 2H00   | 22½°              | 16   | 16  | 20               |   |
|                           | ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                   |  |   |                  |   |
|                           | 2J00   | 30°               | 12   | 12  | 20               |   |
|                           | ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                   |  |   |                  |   |
| 2<br>POLES<br>PER<br>DECK | 2C06   | 11¼°              | 15   | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 12               |   |
|                           | 2E06   | 15°               | 11   | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 12               |   |
|                           | 2H06   | 22½°              | 8  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 12               |   |
|                           | ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                   |  |   |                  |   |
|                           | 2J06   | 30°               | 6  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 12               |   |
|                           | ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                   |  |   |                  |   |



# SHALLCROSS SERIES 2 SHORTING SWITCHES

**3  
POLES  
PER  
DECK**

| SHALLCROSS<br>SERIES   | INDEXING<br>ANGLE             | MAXIMUM<br>POSITIONS<br>PER POLE<br>WITH STOPS | MAXIMUM<br>POSITIONS<br>PER POLE,<br>NO STOPS | MAXIMUM<br>DECKS | DECK<br>CONFIGURATION<br>(VIEWED FROM MOUNTING PLATE) |
|--|-------------------------------|--|---|------------------|---|
| 2C12   | 11 $\frac{1}{4}$ <sup>0</sup> | 7  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 8                |   |
| 2E12   | 15 <sup>0</sup>               | 5  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 8                |   |
| 2H12   | 22 $\frac{1}{2}$ <sup>0</sup> | 4  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 8                |   |
| ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                               |  |   |                  |   |
| 2J12   | 30 <sup>0</sup>               | 3  | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE    | 8                |   |
| ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                               |  |   |                  |   |

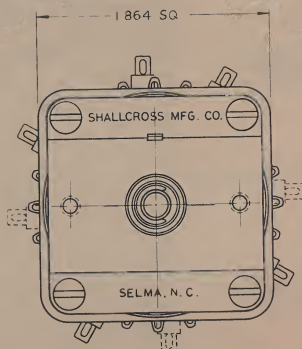
**4  
POLES  
PER  
DECK**

|  |                         |   |  |   |  |
|--|-------------------------|---|--|---|--|
| 2C18   | $11\frac{1}{4}^{\circ}$ | 7 | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE | 6 |  |
| 2E18   | $15^{\circ}$            | 5 | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE | 6 |  |
| 2H18   | $22\frac{1}{2}^{\circ}$ | 4 | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE | 6 |  |
| ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                         |   |  |   |  |
| 2J18   | $30^{\circ}$            | 3 | CONTINUOUS<br>ROTATION<br>NOT<br>AVAILABLE | 6 |  |
| ADJACENT UNNUMBERED AND<br>NUMBERED TERMINALS MUST<br>BE CONNECTED IN PAIRS<br>TO OBTAIN SHORTING ACTION |                         |   |  |   |  |

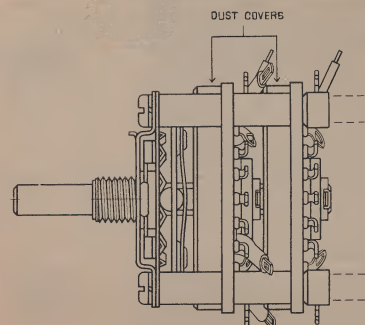


All Standard options described in this foldout are readily available (concentric shaft, spring return and solenoid options will require slightly longer delivery in some cases due to their normally custom nature). Most can be specified using the standard Shallcross part number system but those options without code numbers should be ordered by using Shallcross specification sheets or your own drawings.

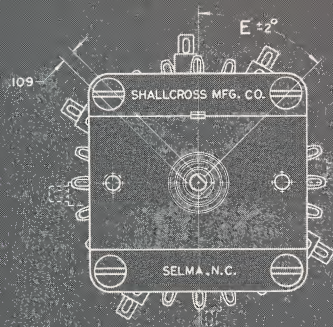
### DUST COVERS



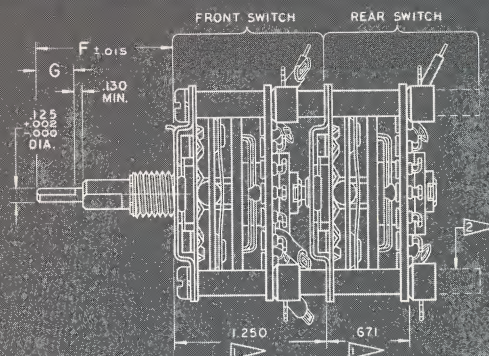
Translucent plastic dust covers for each switch deck provide enhanced voltage breakdown and contact resistance reliability by reducing the possibility of dust and stray particle accumulations on the switch arms, contacts and collector rings. Special rotors and spacers permit the addition of dust covers without altering standard OD and back panel dimensions.



### DUAL CONCENTRIC SHAFT

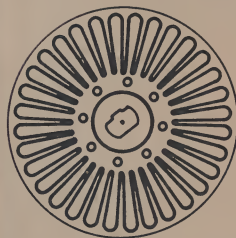


Series 2 dual concentric shaft versions result in a 50% reduction of panel space requirements where their use is appropriate. Two independent switch groups (or switch and potentiometer combinations) are operated by the dual concentric shaft to eliminate the need for 2 separate component mountings. Up to 4 decks per shaft can be supplied.

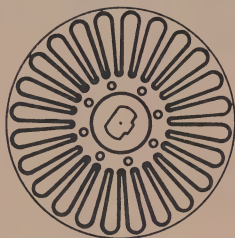


- Dimensions shown are for one deck on each switch. Add .563  $\pm$  .010 for each additional deck on either front or rear switch.
- Rear support spacers are supplied on switches having a total (front & rear switch decks) of 5 or more decks.
- In addition to dimensions shown, specify .250 diameter shaft length (and flat, if required), bushing, and nonturn tang same as standard series 2 switches.
- Specify and supply Shallcross part number (same as standard series 2 code) for both front and rear switches. Specify largest number of poles on front switch (.250 dia. shaft).

### CLUSTER ARMS

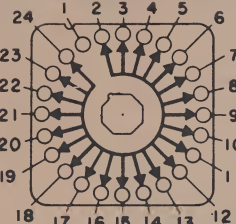


DIAG (1)

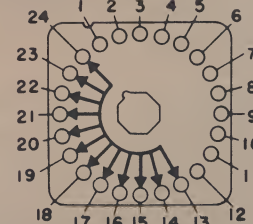


DIAG (2)

24 or 32 position cluster arms can be programmed by removing selected fingers to provide progressive shorting or opening switching action. Clusters will be programmed to your requirements by the factory if the fingers to be removed are specified. A maximum of 4 cluster decks per switch is recommended.



DIAG (3)



DIAG (4)

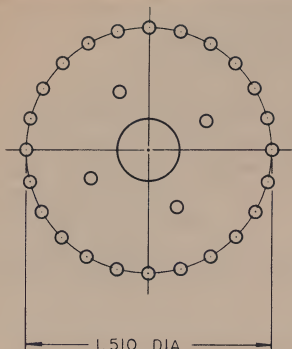
### CLUSTER ARM NOTES

- Wiper arms are shown schematically (as in diagrams 3 & 4 above). Fingers can be omitted as specified but those remaining are electrically common.
- Number 1 contact should be used as a reference. It will be assumed that reference to fingers by number will be on the basis of the shaft in the extreme counterclockwise position or No. 1 position.
- Complete switch assemblies with cluster arm decks are identical to standard switch assemblies in size and mounting. Cluster arm and standard decks are physically interchangeable and may be ganged together.
- Connection to cluster arm can be supplied if specified, otherwise, one contact position must be sacrificed for use as a termination point.
- 30° or 15° indexing available on 24 finger clusters. 22½° or 11¼° indexing available on 32 finger clusters.

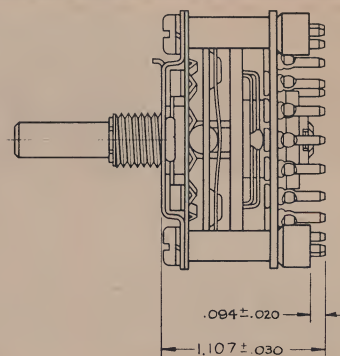


Arms, contacts, and collector rings with a special hard gold .0001" plating are stocked to satisfy applications requiring corrosion proofed current carrying switch parts. Provisions are made for ordering in the standard part number system.

### PRINTED CIRCUIT MOUNTING



The last deck on any Series 2 switch can be provided with terminals suitable for printed circuit board mounting. The diagram at left shows a typical terminal layout, however, the exact configuration will vary with the switch type used — layouts for your specific switch requirement will be provided on request.



### SPRING RETURN

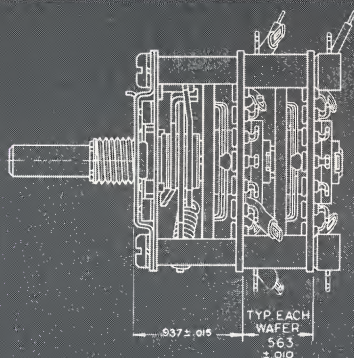


DIAGRAM 1

Spring return action (with or without detenting) can be supplied on all Series 2 switch types.

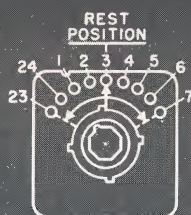


DIAGRAM 2

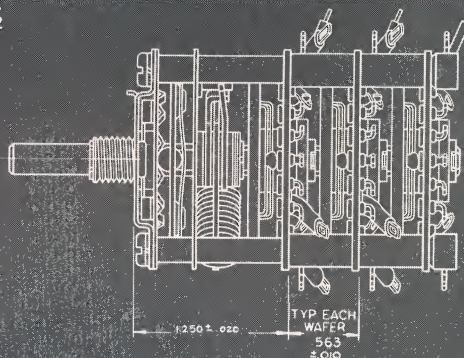


DIAGRAM 3

### SPRING RETURN NOTES

- Size, mounting and deck configurations are same as standard series 2, except back of panel depth is increased to provide for spring (See diagrams 1 & 3 above).
- Specify operation desired by referencing from rest position (Diagram 2 above). Rest position may be moved from that shown to meet operation requirements.  
EXAMPLE  
A. 3 Positions clockwise, spring return  
1 Position counterclockwise, detent  
5 Positions total, including rest  
B. 2 Positions clockwise, spring return with detent feel  
0 Positions counterclockwise  
3 Positions total, including rest
- Maximum throw with spring return must be limited to 75°. Maximum number of positions can be determined from throw of type specified.
- Maximum number of poles with spring return should be limited to six.

### SOLENOID DRIVE



Series 2 switches are adapted to General Time, Inc., and Ledex, Inc., solenoids and offered as standard assemblies.

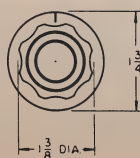
The General Time Assembly meets all requirements of MIL S3785 Style SR16. Inquiries regarding Shallcross solenoid units should be directed to:

Ledex, Inc.  
123 Webster Street  
Dayton 2, Ohio

General Time Corporation  
Central Research Laboratory  
Progress Drive  
Stamford, Connecticut



### STANDARD KNOBS

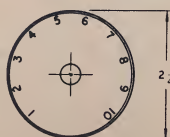


AM27236

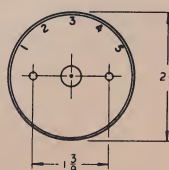


AM26989

### STANDARD DIALS



AS24-0A00



AS24-0B00

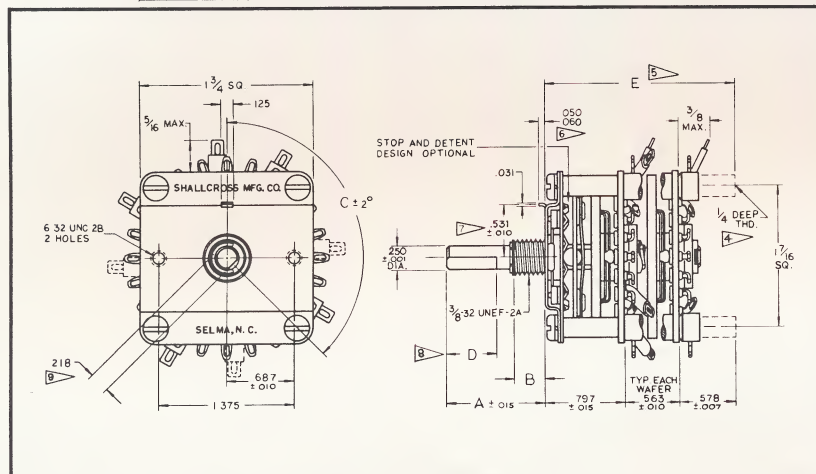
SPECIFY SWITCH  
CODE IN ADDITION  
TO DIAL PART  
NUMBER.



# SHALLCROSS SPECIFICATION SHEET INSTRUCTIONS



## SHALLCROSS SERIES 2 ROTARY SWITCH SPECIFICATION SHEET #2 (MIL-S-3786 STYLE SR14)



| CUSTOMER'S ITEM NO. | SHALLCROSS PART NUMBER  | ANGLE OF THROW | POSITIONS PER POLE | NUMBER OF DECKS | POLES PER DECK 1, 2, 3 OR 4 | DIM. A | DIM. B | BUSHING LENGTH | FLAT ANGLE | FLAT LENGTH |
|---------------------|---|----------------|--------------------|-----------------|-----------------------------|--------|--------|----------------|------------|-------------|
| -001                | 2J50A12-3D  | 30°            | 12                 | 3               | 1                           | 1"     | 5/16"  | —              | —          | —           |
| -002                | 2C00B32-5-K06   | 11 1/2°        | 32                 | 5               | 1                           | 3/4"   | 0"     | —              | —          | —           |
| -003                | 2J00C11-6 (XXX)   | 30°            | 11                 | 6               | 1                           | 1 1/4" | 1/2"   | —              | —          | —           |
| -004                | 2J56A6-2 (XXX)  | 30°            | 6                  | 2               | 2                           | 1"     | 5/16"  | 105°           | 1/2"       | —           |
| -005                | SUFFIX CODES ADDED TO FACTORY TO DENOTE FLAT ANGLE OR OTHER SPECIAL REQUIREMENTS NOT COVERED BY STANDARD PART # |                |                    |                 |                             |        |        |                |            |             |
| -006                |   |                |                    |                 |                             |        |        |                |            |             |
| -007                |   |                |                    |                 |                             |        |        |                |            |             |
| -008                |   |                |                    |                 |                             |        |        |                |            |             |
| -009                |   |                |                    |                 |                             |        |        |                |            |             |
| -010                |   |                |                    |                 |                             |        |        |                |            |             |

### ELECTRICAL RATINGS (MIL S3786 STYLE SR14)

POWER (50,000 cycles rotational life at +125°C)

|                         | INDUCTIVE LOAD (2.8 HENRIES) |            | RESISTIVE LOADS (A.C. OR D.C.) |       |
|-------------------------|------------------------------|------------|--------------------------------|-------|
|                         | MILLI-AMPERES                | VOLTS D.C. | MILLI-AMPERES                  | VOLTS |
| AT ATMOSPHERIC PRESSURE | 50                           | 30         | 500                            | 30    |
|                         |                              |            | 50                             | 300   |

**VOLTAGE BREAKDOWN** (at atmospheric pressure)  
Initial — 1500 volts RMS  
End of life — 1000 volts RMS

**CONTACT RESISTANCE** (Maximum)  
Initial and after vibration and shock — 5 milliohms  
After moisture resistance and salt spray — 5 milliohms  
After life (rotational) tests — 10 milliohms

**INSULATION RESISTANCE** — Per Mil S3786

### MECHANICAL RATINGS

**STOP STRENGTH** — 50 inch/lbs.  
**ROTATIONAL TORQUE LIMITS** —

| TEMPERATURE | TORQUE (LB-IN.)              |         |                            |
|-------------|------------------------------|---------|----------------------------|
|             | UP TO 5 SECTIONS OR 10 POLES |         | UP TO 10 DECKS OR 15 POLES |
|             | MINIMUM                      | MAXIMUM | MAXIMUM                    |
| + 25°C      | 1 1/2                        | 6       | 10                         |
| - 65°C      | 1 1/2                        | 8       | 13                         |

### ENVIRONMENTAL RATINGS

**TEMPERATURE RANGE** — 65°C to +125°C

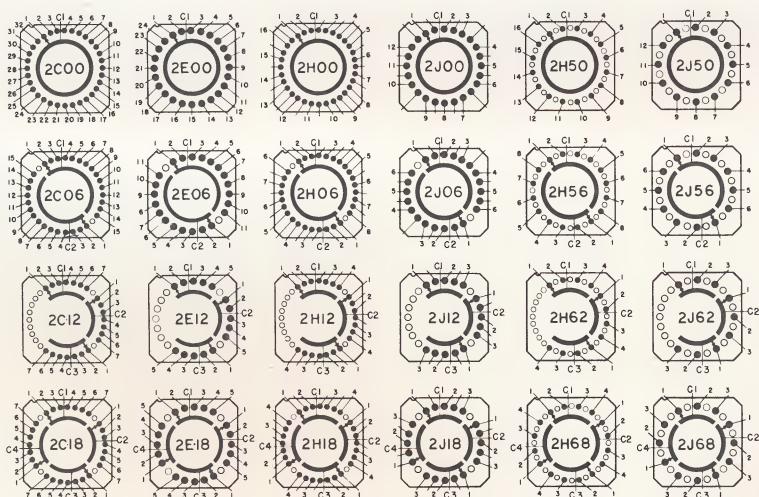
CUSTOMER \_\_\_\_\_  
PART NO. \_\_\_\_\_

VIBRATION  
SHOCK  
SALT SP  
THERMA

DETENT SPRING  
MTG. HARDW  
18-8 stainless  
WIPER ARMS  
CONTACTS, C  
plate optional  
STATOR (dec  
TERMINALS (COMMON AN  
telon sleeve  
ROTOR BEAR  
ROTOR — di  
STOP PIN RE  
SCREWS, STL  
DECK SPACE

Life vs poles (which switches with 2-10 poles)  
All dimensions are in inches, and all sections are in inches.  
All sections are in inches.  
Maximum section with adjacent terminals in action. Decks the mtg. plate is used.  
Rear 1 over.  
Rear 2 of 6 decks or Stand.  
120° available.  
Stand dimension is used.  
Minimum (bushing 1/16" Stand. able).

DRAWN \_\_\_\_\_  
CHECKED \_\_\_\_\_  
APPROVED \_\_\_\_\_





11 12 13

1

2

3

4

5

6

7

8

9

10

11

12

13

14

## ENVIRONMENTAL RATINGS

- High impact per Mil S3786

SHOCK — Per Mil 3786

IG AND BALLS, SHAFT, MTG. PLATE, STOP  
OR RETAINING PLATE, BALL RETAINED.

IG AND BALLS, SHAFT, MTG. PLATE, STOPS, BUSHING,  
RE-RETAINER PLATE, BALL RETAINER

COLLECTOR RINGS, SEGMENTS — solid silver alloy (gold

9 CORNER TERMINAL — copper alloy (tin dipped and insulated)

OS AND DETENT SPACERS — nickel plated brass

NOTES

(SUBJECT TO CHANGE)

Dimensions are in inches unless otherwise specified. Toler-

number of positions for one shaft is determined by most poles,  $22\frac{1}{2}^\circ$  and  $30^\circ$  throw switches must have ad-

Support spacers supplied on 6 decks and

and distance from shaft center to tang center .531" (this

and dimension .218"  $\pm$ .005" (optional dimensions available).

DATE \_\_\_\_\_

DATE \_\_\_\_\_

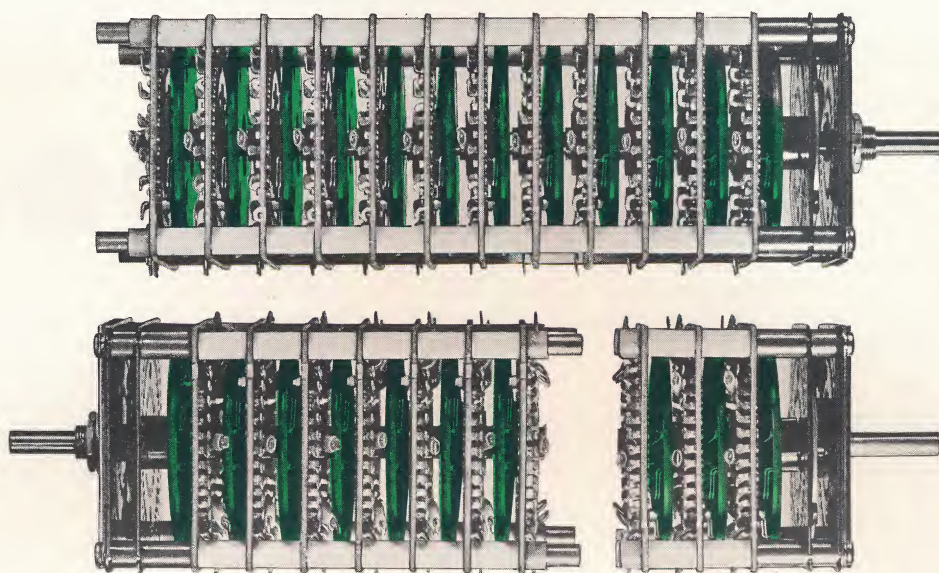




*shallcross*

**SERIES 4**

**ROTARY SWITCH LINE**



## FEATURES:

- |   |   |
|---|---|
| <b>1</b> Meet all requirements of MIL-S-3786 Style SR15.  | <b>7</b> Flared terminal lugs (integral with contacts) promote wiring ease.                                   |
| <b>2</b> Up to 48 positions per deck.   | <b>8</b> Coin silver and silver alloy current carrying parts assure thermal EMF ratings below 1 microvolt/°C. |
| <b>3</b> Select glass fibre impregnated epoxy laminate decks promote maximum structural strength and insulation resistance. | <b>9</b> Captive Dual balls riding a ball and socket type detent establish positive, long life detenting.     |
| <b>4</b> Special configuration dual leaf wiper arms provide exceptionally low and stable contact resistance.                | <b>10</b> Insulation resistance ratings in excess of $10^{14}$ ohms.  |
| <b>5</b> Adjustable stops.  | <b>11</b> Definitive Ratings.   |
| <b>6</b> Compact design affords reduced back panel depths.  |   |

## GENERAL

Shallcross Series 4 rotary switches are similar in design to their Series 2 counterparts, however, the deck dimension has been increased to 2½" to provide 48 contacts per deck and the detent mechanism has been altered to assure positive and accurate indexing. The OD dimension for many 48 position switches is slightly less than the 2½" chosen for series 4 equivalents, however, the larger dimension was selected to assure higher voltage breakdown ratings, more accurate detenting and enhanced overall reliability. Back of panel space requirements for all Series 4 types are appreciably less than those required for competitive switches in the same class.

The exceptional structural strength, contact resistance, insulation resistance and thermal EMF characteristics of this switch group recommends their application in MIL-S-3786, Style SR15, military applications, space and missile high reliability requirements, and precision commercial instrumentation.



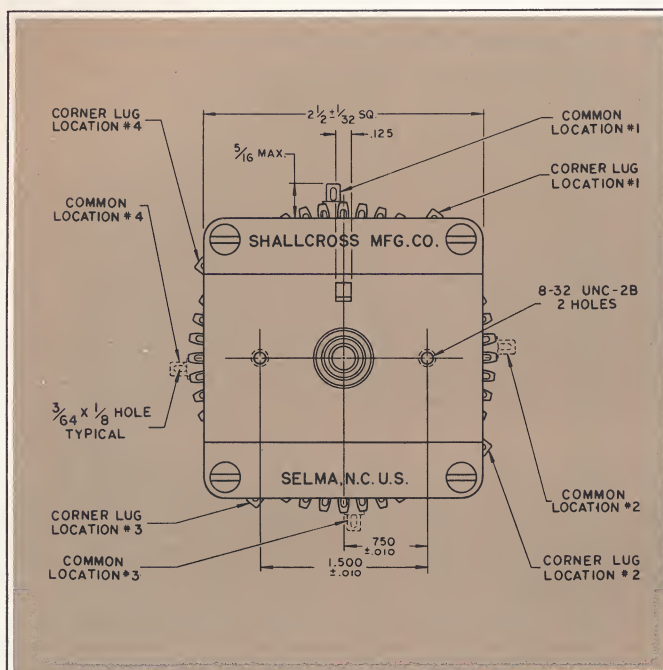


DIAGRAM 1

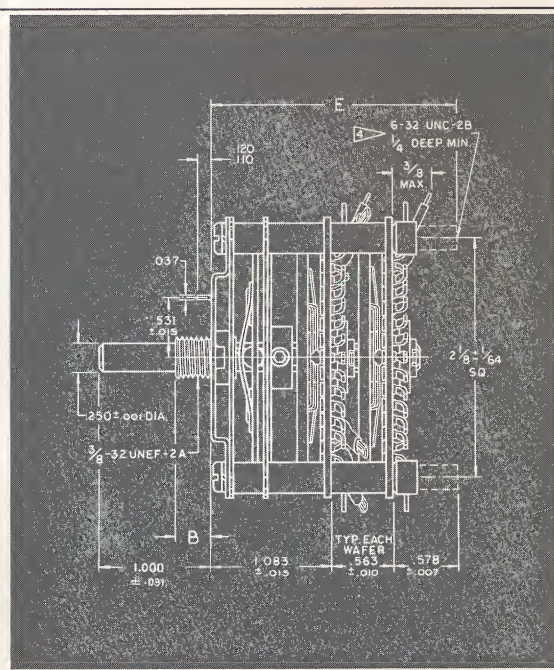


DIAGRAM 2

➤ Rear support spacers and nylon cups are supplied (and included in E dimension) on 5 decks and over.

## COMMON AND CORNER TERMINAL LOCATIONS

| SWITCH TYPE      |      | TERMINAL LOCATIONS FROM (DIAGRAM 1) |                  |
|------------------|------|-------------------------------------|------------------|
|                  |      | COMMON TERMINALS                    | CORNER TERMINALS |
| 1 POLE PER DECK  | 4A00 | #1                                  | ALL FOUR         |
|                  | 4E50 | #1                                  | NONE             |
| 2 POLES PER DECK | 4A06 | #1 & #3                             | #1 & #3          |
|                  | 4E56 | #1 & #3                             | NONE             |
| 3 POLES PER DECK | 4A12 | #1, #2 & #3                         | NONE             |
|                  | 4E62 | #1, #2 & #3                         | NONE             |
| 4 POLES PER DECK | 4A18 | ALL FOUR                            | NONE             |
|                  | 4E68 | ALL FOUR                            | NONE             |

## BACK OF PANEL DIMENSIONS VS. NUMBER OF DECKS

| NUMBER OF DECKS | MAX. OVERALL LENGTH (INCHES)                              | NOMINAL OVERALL LENGTH (INCHES) | NOMINAL OVERALL LENGTH TOLERANCE (± IN.) |
|-----------------|---|---------------------------------|--|
| 1               | 1.473   |                                 |  |
| 2               | 2.046   |                                 |  |
| 3               | 2.619   |                                 |  |
| 4               | 3.192   |                                 |  |
| 5               | TO OBTAIN MAXIMUM OVERALL LENGTH ADD TOLERANCE TO NOMINAL | 3.913                           | .062                                     |
| 6               |   | 4.476                           | .072                                     |
| 7               |   | 5.039                           | .082                                     |
| 8               |   | 5.602                           | .092                                     |
| 9               |   | 6.165                           | .102                                     |
| 10              |   | 6.728                           | .112                                     |
| 11              |   | 7.291                           | .122                                     |
| 12              |   | 7.854                           | .132                                     |
| 13              |   | 8.417                           | .142                                     |
| 14              |   | 8.980                           | .152                                     |
| 15              |   | 9.543                           | .162                                     |

## MATERIALS

Detent Spring and Balls, Shaft, Mtg. Plate, Stops, Bushing, Mtg. Hardware, Detent Plate, Ball Retainer, Stop Pin Retainer, Detent Spacers — Passivated Stainless Steel

Wiper Arms — Solid Spring Silver Alloy (Gold Plate Optional)

Contacts, Collector Rings, (Segments)— Solid Silver Alloy (Gold Plate Optional)

Stator (Deck Plate) — Epoxy Fiberglass

Contact Lugs — (Integral with Contacts) Solid Silver Alloy

Common and Corner Terminals—Copper Alloy (Tin Dipped and Teflon Sleeve Insulated)

Rotor Bearing, Rotor Spacers, Insulating Cups — Nylon

Rotor — Diallyl Phthalate (Glass Fibre Reinforced)

Screws and Studs — Nickel Plated Brass. Deck Spacers — Steatite

ALL MATERIALS SUBJECT TO CHANGE WITHOUT NOTICE

## SHAFT LENGTHS

SHAFT LENGTHS ARE MEASURED FROM END OF SHAFT TO MOUNTING SURFACE. STANDARD SHAFT LENGTH IS ONE INCH (± .031"). OPTIONAL SHAFT LENGTHS FROM 1/2 TO 2 ARE AVAILABLE. SHALLCROSS CODE NUMBERS FOR OPTIONAL SHAFT LENGTHS ARE AS FOLLOWS:

| SHAFT LENGTH | 5/8 | 3/4 | 7/8 | 1 1/8 | 1 1/4 | 1 3/8 | 1 1/2 | 1 5/8 | 1 3/4 | 2  |
|--------------|-----|-----|-----|-------|-------|-------|-------|-------|-------|----|
| SHALLX CODE  | 05  | 06  | 07  | 11    | 12    | 13    | 14    | 15    | 16    | 20 |

## STANDARD MTG. BUSHING LENGTHS

| SHALLX TYPE | BUSHING LENGTH (DIM. B) |
|-------------|-------------------------|
| A           | 5/16                    |
| B           | 0                       |
| C           | 1/2                     |
| D           | 3/8                     |
| E           | 3/4                     |

ALL BUSHINGS ARE 3/8-32 UNEF-2A



## ELECTRICAL RATINGS

## LOAD (BREAKING) VS LIFE (CYCLES)

| LOAD              | LIFE   |
|-------------------|--------|
| 0 VOLTS, 0 AMPS   | 50,000 |
| 10 VDC, 10 AMPS   | 50,000 |
| 30 VDC, 4.0 AMPS  | 5,000  |
| 30 VDC, 2.0 AMPS  | 20,000 |
| 30 VDC, 1.0 AMP   | 50,000 |
| 100 VDC, 0.5 AMP  | 25,000 |
| 120 VAC, 2.0 AMPS | 5,000  |
| 120 VAC, 1.0 AMP  | 10,000 |
| 120 VAC, 0.5 AMP  | 35,000 |
| 120 VAC, 0.25 AMP | 50,000 |

## LOAD-LIFE RATING METHODS

All commercial load-life ratings were obtained from tests made under normal room conditions. One life cycle consisted of one full rotation both clockwise and counterclockwise.

The following criteria were established as a failure definition:

**1. MAXIMUM ALLOWABLE CONTACT RESISTANCE (ANY CONTACT)**

| MAXIMUM CONTACT RESISTANCE | APPLIED LOADS (TO AND INCLUDING) |
|----------------------------|----------------------------------|
| .004 $\Omega$              | 30 VOLT AMPERES                  |
| .006 $\Omega$              | 50 VOLT AMPERES                  |
| .01 $\Omega$               | 240 VOLT AMPERES                 |

**2. MINIMUM ALLOWABLE VOLTAGE BREAKDOWN —**

800 volts RMS (between any two active positions or to ground).

**3. MINIMUM ALLOWABLE INSULATION RESISTANCE —**

10<sup>12</sup> ohms (between any two active positions or to ground).

**4. MECHANICAL FAILURE —**

rotational failure, arm misalignment, contact misalignment, etc., (Electrical failure preceded mechanical failure for every sample tested).

## CURRENT CARRYING CAPACITY

10 AMPS (FOR TEMPERATURE RISE < 30°C)

## VOLTAGE BREAKDOWN

(-40°C TO +85°C, 50% RH, SEA LEVEL)

|                  | INITIAL (MINIMUM)      | END OF LIFE (MINIMUM) |
|------------------|------------------------|-----------------------|
| BETWEEN POLES    | 2000 V RMS (60 CYCLES) | 1000V RMS (60 CYCLES) |
| BETWEEN CONTACTS | 1500 V RMS (60 CYCLES) | 800V RMS (60 CYCLES)  |
| TO GROUND        | 3000 V RMS (60 CYCLES) | 2000V RMS (60 CYCLES) |
| BETWEEN DECKS    | 6000 V RMS (60 CYCLES) | 4000V RMS (60 CYCLES) |

## INSULATION RESISTANCE (room conditions)

INITIAL > 10<sup>14</sup>

END OF LIFE > 10<sup>12</sup>

## THERMAL EMF

1  $\mu$  VOLT/°C (MAXIMUM)

ELECTRICAL RATINGS (CONTINUED)  
CAPACITANCE

## POINTS OF MEASUREMENT

BETWEEN ADJACENT ACTIVE CONTACTS

BETWEEN CONTACT AND COMMON TERMINAL

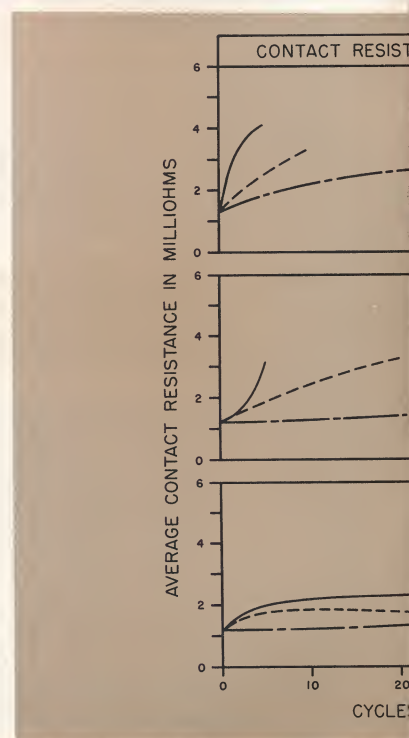
BETWEEN COMMON AND FRAME

BETWEEN POLES — 2 POLES/DECK

BETWEEN POLES — 4 POLES/DECK

## CONTACT RESISTANCE

INITIAL — .002 OHMS MAXIMUM



## ENVIRONMENTAL RATINGS

## TEMPERATURE RANGE

-40°C to +85°C (WHERE RATINGS ARE TO BE MET)

-65°C to +125°C (WHERE DERATED)

## MECHANICAL RATINGS

## STOP STRENGTH

WITHSTAND 50 IN/LB ROTATIONAL TORQUE

## TERMINAL STRENGTH

WITHSTAND 5 LB PULL THROUGH PERPENDICULAR PLANES



GS

ED)

|       | CAPACITANCE         |
|-------|---------------------|
|       | .7 $\mu$ f MAXIMUM  |
| MINAL | .7 $\mu$ f MAXIMUM  |
|       | 6.0 $\mu$ f MAXIMUM |
|       | 2.0 $\mu$ f MAXIMUM |
|       | 1.3 $\mu$ f MAXIMUM |

MUM

ANCE VS LOAD VS LIFE

—— 120 VAC - 2.0 A  
----- 120 VAC - 1.0 A  
----- 120 VAC - 0.5 A

—— 30 VDC - 4.0 A  
----- 30 VDC - 2.0 A  
----- 10 VDC - 10 A

—— 100 VDC - 0.5 A  
----- 10 VDC - 5 A  
----- 0 V - 0 A

(THOUSANDS)

NTAL RATINGS

ALL OTHER COMMERCIAL

E LIFE RATINGS CAN BE

AL RATINGS

ATIONAL FORCE (MINIMUM)

FREE MUTUALLY

## MIL-S-3786 STYLE SR 15 RATINGS

**FOREWORD**—Shallcross Series 4 rotary switches meet all requirements of MIL-S-3786 Style SR15. A portion of the operating specifications and general requirements for this style have been extracted or condensed and provided below.

### GENERAL

Switches, Rotary (circuit selector, low capacity)

### DESIGN AND CONSTRUCTION

All switches shall be of the design construction and physical dimensions shown in Style SR15 MIL-S-3786

### ROTATIONAL LIFE

The temperature—life characteristics shall be test-condition letter C  
After life (rotational) the torque shall change not more than 35 per cent of its initial value. A cycle shall consist of 360 degrees minus the degrees in one throw in a clockwise direction and an equal number of degrees in a counterclockwise direction. The test loads for the applicable circuit conditions shall be as shown in Table V. Each condition shall be switched by at least one rotor contact of the switch.

TABLE V—CIRCUIT VALUES FOR LIFE (ROTATIONAL) TEST

|                         | Inductive load (2.8 henries) |             | Resistive loads (a. c. or d. c.) |       |
|-------------------------|------------------------------|-------------|----------------------------------|-------|
|                         | Milliamperes                 | Volts d. c. | Milliamperes                     | Volts |
| At atmospheric pressure | 50                           | 30          | 500                              | 30    |
|                         |                              |             | 50                               | 300   |

### CONTACT RESISTANCE

Contact resistance shall not exceed the following values:

Initial and after vibration and shock.....5 milliohms  
After moisture-resistance and salt spray.....5 milliohms  
After life (rotational) tests.....10 milliohms

### TORQUE (stops)

Single shaft switches containing stops shall withstand a torque of 50 pound-inches applied to the shaft against the stops in clockwise and counterclockwise directions.

TABLE IV—ROTATIONAL - TORQUE LIMITS

| Temperature  | Torque (lb. - in.) |                     |                                  |
|--------------|--------------------|---------------------|----------------------------------|
|              | Minimum            | 5 sections and less |                                  |
|              |                    | Maximum             | Over 5 to 10 sections<br>Maximum |
| Room.....    | 2                  | 6                   | 16                               |
| Minimum..... | 2                  | 8                   | 20                               |

**INSULATION RESISTANCE**..... Per MIL-S-3786

**TEMPERATURE RANGE**..... -65°C to + 125°C

**VOLTAGE BREAKDOWN**..... The applicable test voltage specified in table VI shall be applied between the specified switch elements, except test voltage will be reduced to 1000 volts, r.m.s. after life test.

TABLE VI—DIELECTRIC - TEST VOLTAGES

| Altitude                | Test Voltage           |
|-------------------------|------------------------|
| At atmospheric pressure | (Volts, r.m.s)<br>1500 |

**VIBRATION**

10-2000 cps per MIL-S-3786

**SALT SPRAY**

48 hours per MIL-S-3786

**SHOCK**

High impact per MIL-S-3786

**THERMAL SHOCK**

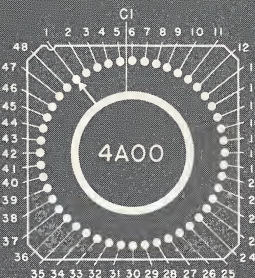
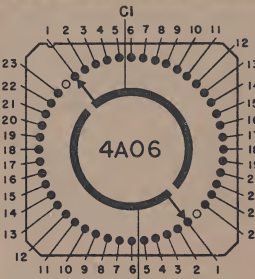
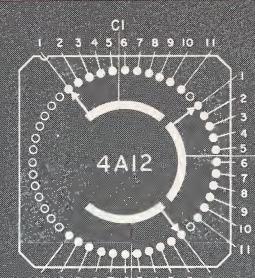
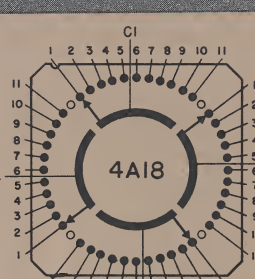
MIL-S-3786

SEE SHALLCROSS ORDER CODE (PAGE 12)







# SERIES 4 ORDERING CHARTS

## SHORTING SWITCHES (MAKE BEFORE BREAK)

|                            | SHALL CROSS CODE | INDEXING ANGLE | MAXIMUM POSITION PER POLE (With Stops) | MAXIMUM POSITION PER POLE (No Stops) | MAXIMUM DECKS | DECK CONFIGURATION (VIEWED FROM MOUNTING PLATE)                                      |
|----------------------------|------------------|----------------|--|--------------------------------------|---------------|--|
| <b>1</b><br>POLE PER DECK  | 4A00             | 7½°            | 47                                     | 48                                   | 15            |    |
| <b>2</b><br>POLES PER DECK | 4A06             | 7½°            | 23                                     | CONTINUOUS ROTATION NOT AVAILABLE    | 10            |    |
| <b>3</b><br>POLES PER DECK | 4A12             | 7½°            | 11                                     | CONTINUOUS ROTATION NOT AVAILABLE    | 7             |   |
| <b>4</b><br>POLES PER DECK | 4A18             | 7½°            | 11                                     | CONTINUOUS ROTATION NOT AVAILABLE    | 6             |  |

## NON SHORTING SWITCHES (BREAK BEFORE MAKE)

|                            | SHALL CROSS CODE | INDEXING ANGLE | MAXIMUM POSITION PER POLE (With Stops) | MAXIMUM POSITION PER POLE (No Stops) | MAXIMUM DECKS | DECK CONFIGURATION (VIEWED FROM MOUNTING PLATE)                                       |
|----------------------------|------------------|----------------|--|--------------------------------------|---------------|---|
| <b>1</b><br>POLE PER DECK  | 4E50             | 15°            | 24                                     | 24                                   | 15            |    |
| <b>2</b><br>POLES PER DECK | 4E56             | 15°            | 12                                     | CONTINUOUS ROTATION NOT AVAILABLE    | 10            |    |
| <b>3</b><br>POLES PER DECK | 4E62             | 15°            | 6                                      | CONTINUOUS ROTATION NOT AVAILABLE    | 7             |   |
| <b>4</b><br>POLES PER DECK | 4E68             | 15°            | 6                                      | CONTINUOUS ROTATION NOT AVAILABLE    | 6             |  |

SEE SHALLCROSS ORDER CODE (PAGE 12)



March 15, 1965

**SHALLCROSS**  
**SERIES 1 ROTARY SWITCH**  
**NET PRICE LIST**

PS-44A

| TYPES : 1J04 1J06 ( 2 - 6 Positions/Pole )<br>1J54 1J56 |         |         |         |         |           |           |          |
|---|---------|---------|---------|---------|-----------|-----------|----------|
| TOTAL POLES   | 1 - 9   | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| 1   | \$ 5.90 | \$ 4.70 | \$ 4.05 | \$ 3.55 | \$ 3.05   | \$ 2.85   | \$ 2.70  |
| 2   | 6.75    | 5.55    | 4.85    | 4.25    | 3.80      | 3.60      | 3.40     |
| 3   | 7.70    | 6.50    | 5.60    | 5.25    | 4.70      | 4.40      | 4.20     |
| 4   | 8.50    | 7.60    | 6.80    | 6.25    | 5.65      | 5.30      | 5.05     |
| 5   | 9.95    | 9.00    | 8.10    | 7.45    | 6.75      | 6.30      | 6.00     |
| 6   | 11.45   | 10.40   | 9.40    | 8.65    | 7.85      | 7.30      | 6.95     |
| 7   | 12.95   | 11.80   | 10.70   | 9.85    | 8.95      | 8.30      | 7.90     |
| 8   | 14.45   | 13.20   | 12.00   | 11.05   | 10.05     | 9.30      | 8.85     |
| 9   | 15.95   | 14.60   | 13.30   | 12.25   | 11.15     | 10.30     | 9.80     |
| 10  | 17.45   | 16.00   | 14.60   | 13.45   | 12.25     | 11.30     | 10.75    |
| Add to 10 pole price for each additional pole up to 20. | 1.50    | 1.40    | 1.30    | 1.20    | 1.10      | 1.00      | .95      |

| TYPES : 1J00 1J02 ( 2 - 12 Positions/Pole )<br>1J50 1J52 |       |         |         |         |           |           |          |
|--|-------|---------|---------|---------|-----------|-----------|----------|
| TOTAL POLES  | 1 - 9 | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| 1  | 6.50  | 5.40    | 4.60    | 4.30    | 4.00      | 3.85      | 3.70     |
| 2  | 8.00  | 6.75    | 5.85    | 5.50    | 5.30      | 5.15      | 5.00     |
| 3  | 10.00 | 8.20    | 7.40    | 7.15    | 6.90      | 6.80      | 6.70     |
| 4  | 12.00 | 10.75   | 9.90    | 9.40    | 9.05      | 8.75      | 8.55     |
| 5  | 14.00 | 13.10   | 12.10   | 11.45   | 11.00     | 10.65     | 10.40    |
| 6  | 16.50 | 15.45   | 14.30   | 13.50   | 12.95     | 12.55     | 12.25    |
| 7  | 19.00 | 17.80   | 16.50   | 15.55   | 14.90     | 14.45     | 14.10    |
| 8  | 21.50 | 20.15   | 18.70   | 17.60   | 16.85     | 16.35     | 15.95    |
| 9  | 24.00 | 22.50   | 20.90   | 19.65   | 18.80     | 18.25     | 17.80    |
| 10   | 26.50 | 24.85   | 23.10   | 21.70   | 20.75     | 20.15     | 19.65    |

**SERIES 1 STANDARD OPTION NET PRICE LIST**

| SWITCH QUANTITY           |       |         |         |         |           |           |          |
|---------------------------|-------|---------|---------|---------|-----------|-----------|----------|
| ADD-ON PER SWITCH         | 1 - 9 | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| Flatted shafts (per flat) | .90   | .75     | .65     | .60     | .55       | .50       | .45      |
| Special shaft length      | .50   | .45     | .40     | .35     | .30       | .25       | .20      |
| Shaft seal                | 3.25  | 2.15    | 1.75    | 1.60    | 1.45      | 1.35      | 1.25     |

| SWITCH QUANTITY                             |       |         |         |         |           |           |          |
|---|-------|---------|---------|---------|-----------|-----------|----------|
| ADD-ON PER DECK                             | 1 - 9 | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| Gold-Plated (.0001") current carrying parts | .50   | .45     | .40     | .38     | .35       | .33       | .31      |

**SHALLCROSS MANUFACTURING COMPANY**

PRESTON STREET

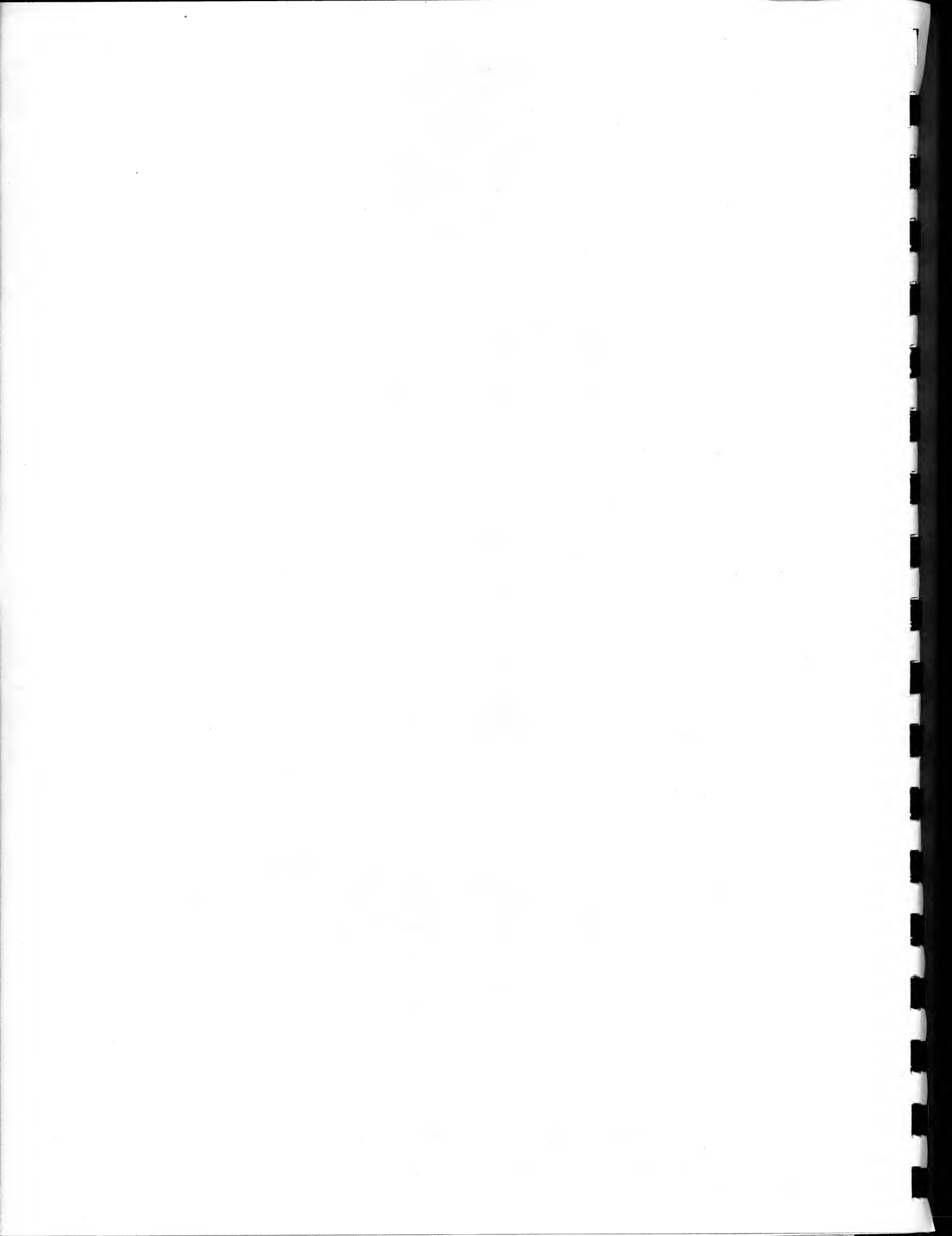
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SELMA, NORTH CAROLINA 27576

TWX: 919-830-2486

TELEPHONE 965-2341







January 1, 1966

**SHALLCROSS**  
**SERIES 2 ROTARY SWITCH**  
**NET PRICE LIST**

PS-41B

**ONE POLE PER DECK**  
**Types 2E00, 2C00, 2J00, 2H00, 2H50, 2J50**

**SWITCH QUANTITY**

| NO. DECKS | 1 - 9  | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
|-----------|--|---------|---------|---------|-----------|-----------|----------|
| 1         | \$ 9.75  | \$ 8.85 | \$ 7.10 | \$ 6.45 | \$ 5.90   | \$ 5.40   | \$ 5.10  |
| 2         | 14.25  | 12.90   | 10.35   | 9.40    | 8.65      | 7.85      | 7.50     |
| 3         | 18.75  | 16.95   | 13.65   | 12.40   | 11.35     | 10.35     | 9.85     |
| 4         | 25.00  | 21.00   | 16.90   | 15.35   | 14.10     | 12.80     | 12.25    |
| 5         | 30.55  | 25.05   | 20.15   | 18.35   | 16.80     | 15.30     | 14.70    |
| 6         | 35.50  | 29.10   | 23.45   | 21.30   | 19.55     | 17.75     | 16.95    |
| 7         | 47.00  | 38.55   | 31.05   | 28.20   | 25.85     | 23.50     | 21.65    |
| 8         | 51.95  | 42.60   | 34.30   | 31.20   | 28.60     | 26.00     | 24.95    |
| 9         | 56.90  | 46.65   | 37.55   | 34.15   | 31.30     | 28.45     | 26.20    |
| 10        | 61.85  | 50.70   | 40.80   | 37.10   | 34.05     | 30.95     | 28.45    |
| 11 Up     | Add to 10 deck price for each additional deck: |         |         |         |           |           |          |
|           | 5.00   | 4.50    | 4.00    | 3.50    | 3.25      | 3.10      | 3.00     |

**TWO POLES PER DECK**  
**Types 2C06, 2E06, 2H06, 2J06, 2H56, 2J56**

**SWITCH QUANTITY**

| NO. DECKS | 1 - 9   | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
|-----------|---------|---------|---------|---------|-----------|-----------|----------|
| 1         | \$10.50 | \$ 9.50 | \$ 7.65 | \$ 6.95 | \$ 6.35   | \$ 5.80   | \$ 5.30  |
| 2         | 15.50   | 14.00   | 11.25   | 10.25   | 9.40      | 8.55      | 7.85     |
| 3         | 20.50   | 18.50   | 14.90   | 13.55   | 12.40     | 11.30     | 10.40    |
| 4         | 28.05   | 23.00   | 18.50   | 16.85   | 15.45     | 14.05     | 12.90    |
| 5         | 33.55   | 27.50   | 22.15   | 20.15   | 18.45     | 16.80     | 15.45    |
| 6         | 39.05   | 32.05   | 25.80   | 23.45   | 21.50     | 19.55     | 17.95    |
| 7         | 51.15   | 41.95   | 33.75   | 30.70   | 28.15     | 25.60     | 23.50    |
| 8         | 56.65   | 46.45   | 37.40   | 34.00   | 31.15     | 28.35     | 26.05    |
| 9         | 62.15   | 51.00   | 41.05   | 37.30   | 34.20     | 31.10     | 28.60    |
| 10        | 67.65   | 55.50   | 44.65   | 40.60   | 37.20     | 33.85     | 31.10    |
| 11        | 81.95   | 67.20   | 54.10   | 49.20   | 45.10     | 41.00     | 37.70    |
| 12        | 87.95   | 72.45   | 58.60   | 53.20   | 48.85     | 44.60     | 41.15    |

**THREE POLES PER DECK**  
**Types 2C12, 2E12, 2H12, 2J12, 2H62, 2J62**

**SWITCH QUANTITY**

| NO. DECKS | 1 - 9   | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
|-----------|---------|---------|---------|---------|-----------|-----------|----------|
| 1         | \$11.50 | \$10.20 | \$ 8.20 | \$ 7.45 | \$ 6.80   | \$ 6.20   | \$ 5.80  |
| 2         | 17.25   | 15.15   | 12.20   | 11.10   | 10.15     | 9.25      | 8.70     |
| 3         | 22.75   | 20.10   | 16.20   | 14.75   | 13.50     | 12.30     | 11.50    |
| 4         | 30.55   | 25.05   | 20.20   | 18.40   | 16.85     | 15.35     | 14.25    |
| 5         | 36.60   | 30.00   | 24.20   | 22.05   | 20.20     | 18.40     | 17.20    |
| 6         | 42.65   | 34.95   | 28.20   | 25.70   | 23.55     | 21.45     | 20.25    |
| 7         | 55.30   | 45.35   | 36.50   | 33.20   | 30.40     | 27.65     | 25.95    |
| 8         | 61.35   | 50.30   | 40.50   | 36.85   | 33.75     | 30.70     | 29.25    |

Supersedes PS-41A, Dated 12-1-64



**SHALLCROSS SERIES 2 ROTARY SWITCH NET PRICE LIST CONTINUED**

PS-41B

**FOUR POLES PER DECK**  
**Types 2C18, 2E18, 2H18, 2J18, 2H68, 2J68**

| NO. DECKS | SWITCH QUANTITY |         |         |         |           |           |          |
|-----------|-----------------|---------|---------|---------|-----------|-----------|----------|
|           | 1 - 9           | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| 1         | \$12.95         | \$10.85 | \$ 8.70 | \$ 7.95 | \$ 7.25   | \$ 6.60   | \$ 6.25  |
| 2         | 18.75           | 16.25   | 13.05   | 11.95   | 10.90     | 9.90      | 9.30     |
| 3         | 25.00           | 21.65   | 17.40   | 15.95   | 14.55     | 13.20     | 12.70    |
| 4         | 33.00           | 27.05   | 21.75   | 19.95   | 18.20     | 16.50     | 15.85    |
| 5         | 39.60           | 32.45   | 26.10   | 23.95   | 21.85     | 19.80     | 18.95    |
| 6         | 46.20           | 37.85   | 30.45   | 27.95   | 25.50     | 23.10     | 21.95    |

**SERIES 2 STANDARD OPTION NET PRICE LIST**

| ADD ON PER SWITCH  | SWITCH QUANTITY |         |         |         |           |           |          |
|--|-----------------|---------|---------|---------|-----------|-----------|----------|
|  | 1 - 9           | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| FLATTED SHAFTS (Per Flat)                                  | \$ .90          | \$ .75  | \$ .65  | \$ .60  | \$ .55    | \$ .50    | \$ .45   |
| SPECIAL SHAFT LENGTH                                       | 1.00            | .75     | .55     | .45     | .40       | .35       | .30      |
| HIGH VOLTAGE DESIGN  | 2.00            | 1.60    | 1.20    | 1.00    | .85       | .75       | .65      |
| PRINTED CIRCUIT DESIGN                                     | 3.00            | 2.50    | 2.00    | 1.75    | 1.50      | 1.35      | 1.20     |
| SHAFT SEAL   | 3.25            | 2.15    | 1.75    | 1.60    | 1.45      | 1.35      | 1.25     |
| SPRING RETURN  | 7.00            | 5.00    | 4.00    | 3.60    | 3.30      | 3.00      | 2.80     |
| CONCENTRIC SHAFT (Add to sum of individual switch prices.) | 12.50           | 9.50    | 8.50    | 7.50    | 6.75      | 6.25      | 5.75     |

| ADD ON PER DECK   | SWITCH QUANTITY |         |         |         |           |           |          |
|---|-----------------|---------|---------|---------|-----------|-----------|----------|
|   | 1 - 9           | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| DUST COVERS   | \$1.15          | \$ .95  | \$ .85  | \$ .75  | \$ .70    | \$ .65    | \$ .60   |
| CLUSTER ARM (Silver)  | 4.50            | 3.50    | 2.95    | 2.50    | 2.25      | 2.10      | 1.95     |
| CLUSTER ARM (Gold)  | 5.85            | 5.20    | 4.35    | 3.95    | 3.75      | 3.60      | 3.45     |
| GOLD PLATED (.0001") current carrying parts.                              | 3.00            | 2.50    | 2.00    | 1.80    | 1.50      | 1.40      | 1.30     |
| MIL-S-3786 OPTION (Tinned terminals, numbered contacts, special marking.) | 1.50            | 1.25    | 1.00    | .75     | .55       | .45       | .40      |
| NUMBERED CONTACTS *   | .35             | .25     | .20     | .15     | .10       | .08       | .06      |
| SPECIAL SPACERS   | .50             | .45     | .40     | .35     | .30       | .25       | .20      |

\* Included in MIL-S-3786 option automatically but available separately.

# SHALLCROSS MANUFACTURING COMPANY

PRESTON STREET

— SELMA, NORTH CAROLINA 27576

TWX: 919-770-7839

TELEPHONE 919-965-2341



December 1, 1964

**SHALLCROSS**  
**SERIES 4 ROTARY SWITCH**  
**NET PRICE LIST**

PS-42A

**ONE POLE PER DECK**  
**Types 4A00, 4E50**

**SWITCH QUANTITY**

| NO. DECKS | 1 - 9  | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
|-----------|--|---------|---------|---------|-----------|-----------|----------|
| 1         | \$14.00  | \$12.50 | \$10.75 | \$ 9.75 | \$ 9.20   | \$ 8.90   | \$ 8.70  |
| 2         | 20.50  | 17.50   | 16.00   | 14.50   | 13.75     | 13.25     | 13.00    |
| 3         | 27.50  | 24.00   | 21.00   | 18.50   | 17.75     | 17.25     | 17.00    |
| 4         | 34.50  | 30.00   | 27.50   | 25.00   | 24.00     | 23.55     | 22.75    |
| 5         | 41.50  | 35.00   | 32.00   | 30.00   | 28.50     | 27.75     | 27.00    |
| 6         | 48.50  | 41.00   | 36.00   | 35.00   | 33.00     | 32.25     | 31.75    |
| 7         | 55.50  | 46.00   | 41.00   | 40.00   | 38.00     | 37.00     | 36.50    |
| 8         | 62.50  | 51.00   | 46.00   | 45.00   | 44.00     | 42.50     | 41.75    |
| 9         | 69.50  | 58.00   | 54.00   | 50.00   | 48.00     | 46.50     | 45.75    |
| 10        | 76.50  | 68.00   | 62.00   | 55.00   | 53.00     | 52.00     | 51.50    |
| 11        | 86.50  | 77.00   | 70.00   | 62.00   | 59.50     | 58.25     | 57.50    |
| 12 Up     | Add to 11 deck price for each additional deck: |         |         |         |           |           |          |
|           | 10.00  | 9.00    | 8.00    | 7.00    | 6.50      | 6.25      | 6.00     |

**TWO POLES PER DECK**  
**Types 4A06, 4E56**

**SWITCH QUANTITY**

| NO. DECKS | 1 - 9   | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
|-----------|---------|---------|---------|---------|-----------|-----------|----------|
| 1         | \$15.00 | \$13.25 | \$11.35 | \$10.25 | \$ 9.65   | \$ 9.30   | \$ 9.05  |
| 2         | 22.50   | 19.00   | 17.20   | 15.50   | 14.65     | 14.05     | 13.70    |
| 3         | 30.50   | 26.25   | 22.80   | 20.00   | 19.10     | 18.45     | 18.05    |
| 4         | 38.50   | 33.00   | 29.90   | 27.00   | 25.70     | 25.15     | 24.15    |
| 5         | 46.50   | 38.75   | 35.00   | 32.50   | 30.75     | 29.75     | 28.75    |
| 6         | 54.50   | 45.50   | 39.60   | 38.00   | 35.70     | 34.65     | 33.85    |
| 7         | 62.50   | 51.25   | 45.20   | 43.50   | 41.15     | 39.80     | 38.95    |
| 8         | 70.50   | 57.00   | 50.80   | 49.00   | 47.60     | 45.70     | 44.55    |
| 9         | 78.50   | 64.75   | 59.40   | 54.50   | 52.05     | 50.10     | 48.90    |
| 10        | 86.50   | 75.50   | 68.00   | 60.00   | 57.50     | 56.00     | 55.00    |

**THREE POLES PER DECK**  
**Types 4A12, 4E62**

**SWITCH QUANTITY**

| NO. DECKS | 1 - 9   | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
|-----------|---------|---------|---------|---------|-----------|-----------|----------|
| 1         | \$16.00 | \$14.00 | \$11.95 | \$10.75 | \$10.10   | \$ 9.70   | \$ 9.40  |
| 2         | 24.50   | 20.50   | 18.40   | 17.50   | 15.55     | 14.85     | 14.40    |
| 3         | 33.50   | 28.50   | 24.60   | 21.50   | 20.45     | 19.65     | 19.10    |
| 4         | 42.50   | 36.00   | 32.30   | 29.00   | 27.60     | 26.75     | 25.55    |
| 5         | 51.50   | 42.50   | 38.00   | 35.00   | 33.00     | 31.75     | 30.50    |
| 6         | 60.50   | 50.00   | 43.20   | 41.00   | 38.40     | 37.05     | 35.95    |
| 7         | 69.50   | 56.50   | 49.40   | 47.00   | 44.30     | 42.60     | 41.40    |

Supersedes PS-42, Dated 10-17-63



**SHALLCROSS SERIES 4 ROTARY SWITCH NET PRICE LIST CONTINUED**

PS-42A

**FOUR POLES PER DECK**
**Types 4A18, 4E68**

| NO. DECKS | SWITCH QUANTITY |         |         |         |           |           |          |
|-----------|-----------------|---------|---------|---------|-----------|-----------|----------|
|           | 1 - 9           | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| 1         | \$17.00         | \$14.75 | \$12.55 | \$11.25 | \$10.55   | \$10.10   | \$ 9.75  |
| 2         | 26.50           | 22.00   | 19.60   | 17.50   | 16.45     | 15.65     | 15.10    |
| 3         | 36.50           | 30.75   | 26.40   | 23.00   | 21.80     | 20.85     | 20.15    |
| 4         | 46.50           | 39.00   | 34.70   | 31.00   | 29.40     | 28.35     | 26.95    |
| 5         | 56.50           | 46.25   | 41.00   | 37.50   | 35.25     | 33.75     | 32.25    |
| 6         | 66.50           | 54.50   | 46.80   | 44.00   | 41.10     | 39.45     | 38.05    |

**SERIES 4 STANDARD OPTION NET PRICE LIST**

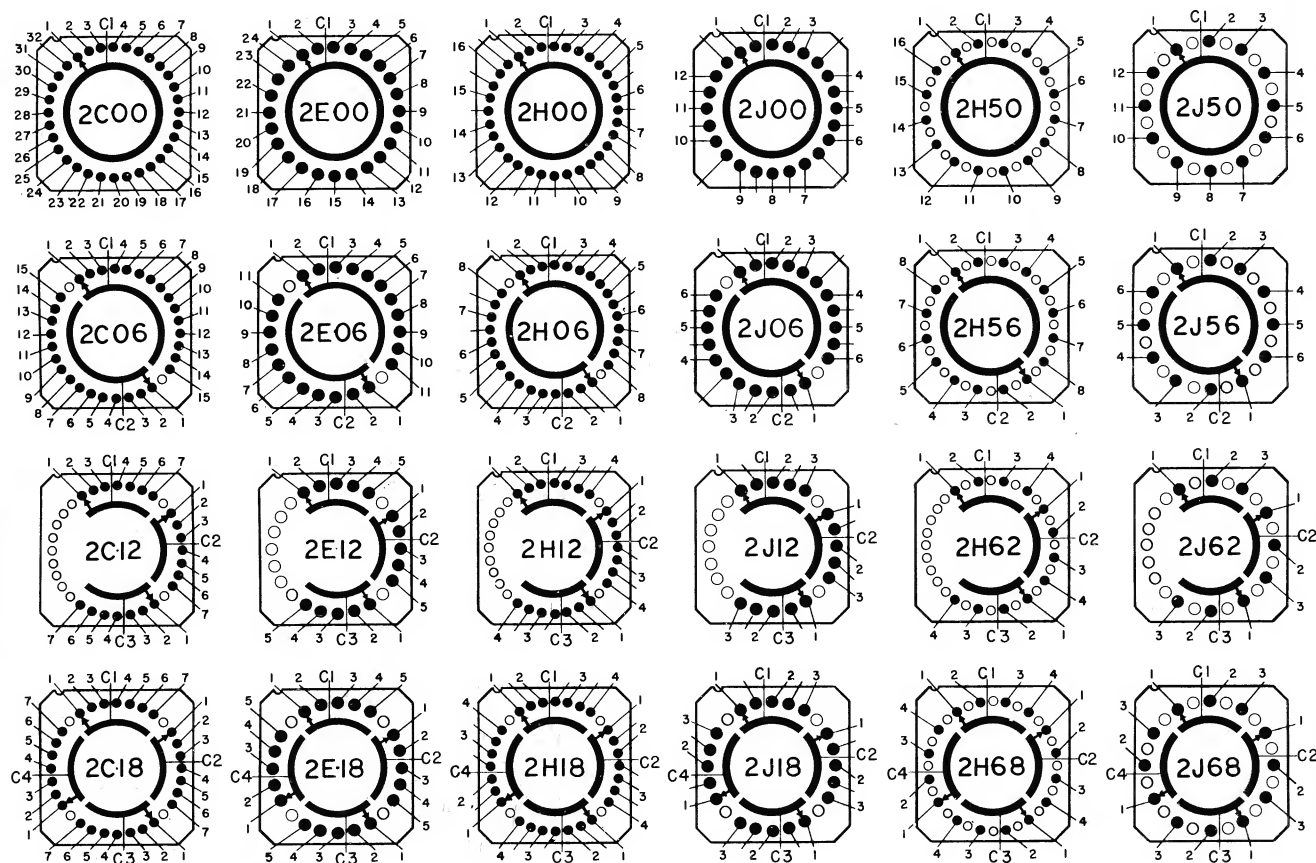
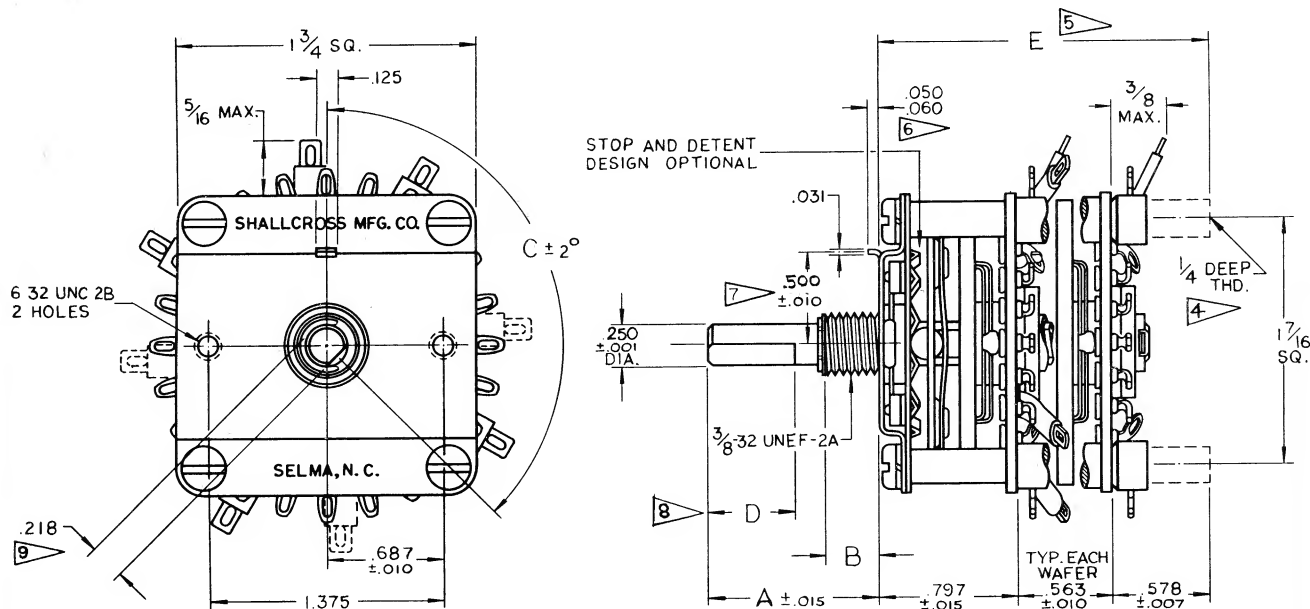
| ADD ON PER SWITCH         | SWITCH QUANTITY |         |         |         |           |           |          |
|---------------------------|-----------------|---------|---------|---------|-----------|-----------|----------|
|                           | 1 - 9           | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| FLATTED SHAFTS (Per Flat) | \$ .90          | \$ .75  | \$ .65  | \$ .60  | \$ .55    | \$ .50    | \$ .45   |
| SPECIAL SHAFT LENGTH      | 1.00            | .75     | .55     | .45     | .40       | .30       | .25      |

| ADD ON PER DECK  | SWITCH QUANTITY |         |         |         |           |           |          |
|--|-----------------|---------|---------|---------|-----------|-----------|----------|
|  | 1 - 9           | 10 - 24 | 25 - 49 | 50 - 99 | 100 - 249 | 250 - 499 | 500 - Up |
| NUMBERED CONTACTS *  | \$ .40          | \$ .30  | \$ .25  | \$ .20  | \$ .15    | \$ .11    | \$ .08   |
| MIL-S-3786 OPTION<br>(tinned terminals,<br>numbered contacts,<br>special marking.) | 1.75            | 1.50    | 1.25    | 1.00    | .75       | .60       | .55      |
| GOLD PLATED (.001")<br>current carrying<br>parts.                                  | 4.00            | 3.50    | 3.00    | 2.60    | 2.20      | 2.00      | 1.90     |







\* Included in MIL-S-3786 option automatically but available separately.



SHALLCROSS PRECISION KUIAKI SWILCHES





| CUSTOMER'S<br>ITEM NO. | SHALLCROSS<br>PART<br>NUMBER | ANGLE<br>OF THROW | POSITIONS<br>PER POLE | NUMBER<br>OF DECKS | POLES PER DECK<br>1, 2, 3 OR 4 | <br>SHAFT<br>LENGTH<br>DIM.<br>A | <br>BUSHING<br>LENGTH<br>DIM.<br>B | <br>FLAT<br>ANGLE<br>DIM.<br>C | <br>FLAT<br>LENGTH<br>DIM.<br>D | <br>BACK PANEL<br>DEPTH<br>DIM.<br>E | INDICATE S (SHORTING)<br>OR NS (NON SHORTING)<br>FOR EACH DECK<br> |    | DUST<br>COVER |    | GOLD PLATED<br>CURRENT<br>CARRYING PARTS |    | TERMINAL<br>LOCATIONS                     |
|------------------------|------------------------------|-------------------|-----------------------|--------------------|--------------------------------|---|---|---|--|---|---|----|---------------|----|--|----|---|
|                        |                              |                   |                       |                    |                                |   |   |   |  |   | S   | NS | YES           | NO | YES                                      | NO |   |
|                        |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -001                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    | AS SHOWN AT LOWER LEFT FOR TYPE SPECIFIED |
| -002                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -003                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -004                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -005                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -006                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -007                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -008                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -009                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |
| -010                   |                              |                   |                       |                    |                                |   |   |   |  |   |   |    |               |    |  |    |   |

## ELECTRICAL RATINGS (COMMERCIAL) POWER (BREAKING)

| LOAD (BREAKING) | VS. | LIFE (CYCLES) |
|-----------------|-----|---------------|
| LOAD            |     | LIFE          |
| 250 VDC .1 AMP  |     | 50,000        |
| 100 VDC .5 AMP  |     | 20,000        |
| 30 VDC 2 AMPS   |     | 20,000        |
| 120 VAC 2 AMPS  |     | 10,000        |
| NO LOAD         |     | 100,000       |

**CURRENT (CARRYING)** — 10 Amps. Maximum  
**INITIAL VOLTAGE BREAKDOWN** (25°C, 50% RH, sea level)

**BETWEEN CONTACTS** — 1500 volts RMS (60 cycles)

**BETWEEN POLES** — 2000 volts RMS (60 cycles)

**CIRCUIT TO GROUND** — 3000 volts RMS (60 cycles)

**INSULATION RESISTANCE (ROOM CONDITIONS)** —  $> 10^{14}$  OHMS

**CONTACT RESISTANCE (INITIAL)** — .002 OHMS Maximum

**THERMAL EMF** —  $< 1 \mu$  volt/°C

## ENVIRONMENTAL RATINGS

**TEMPERATURE RANGE** — 40°C to + 85°C

## MECHANICAL RATINGS

**STOP STRENGTH** —  $> 50$  inch/lbs.

|                |
|----------------|
| CUSTOMER _____ |
| PART NO. _____ |

## MATERIALS

(SUBJECT TO CHANGE)

DETENT SPRING AND BALLS, SHAFT, MTG. PLATE, STOPS, BUSHING, MTG. HARDWARE, DETENT PLATE, BALL RETAINER, — passivated stainless steel  
 WIPER ARMS — solid spring silver alloy (gold plate optional)

CONTACTS, COLLECTOR RINGS, SEGMENTS — solid silver alloy (gold plate optional)

STATOR (deck plate) — epoxy fiberglass

TERMINALS (integral with contact)—solid silver alloy  
 COMMON AND CORNER TERMINAL — copper alloy (tin dipped and teflon sleeve insulated)

ROTOR BEARING, ROTOR SPACERS, INSULATOR CUPS — nylon

ROTOR — diallyl phthalate (glass fibre reinforced)

STOP PIN RETAINER — nickel silver

SCREWS, STUDS AND DETENT SPACERS — nickel plated brass

DECK SPACERS — steatite

## NOTES

Life vs. load ratings apply for switches with up to 10 decks or 24 poles (whichever is greater). Life specifications must be derated for switches with greater number of decks or poles.

All dimensions are in inches unless otherwise specified. Tolerances are  $\pm 1/64$ " for fractional dimensions,  $\pm .005$ " for decimal dimensions, and  $\pm 2^\circ$  for angular specifications, unless otherwise specified.

All sections operated by one shaft must have same throw (indexing). Maximum number of positions for one shaft is determined by section with most poles. 22½° and 30° throw switches must have adjacent terminals (unnumbered to numbered) connected to obtain shorting action. Decks are numbered sequentially beginning with deck nearest mtg. plate.

Rear support spacers supplied on 6 decks and over.

Rear support spacers are included in "E" dimension for switches of 6 decks or more only.

Standard tang length is .050" to .060". Optional tang length .110" to .120" available.

Standard distance from shaft center to tang center .500"  $\pm .010$ ".

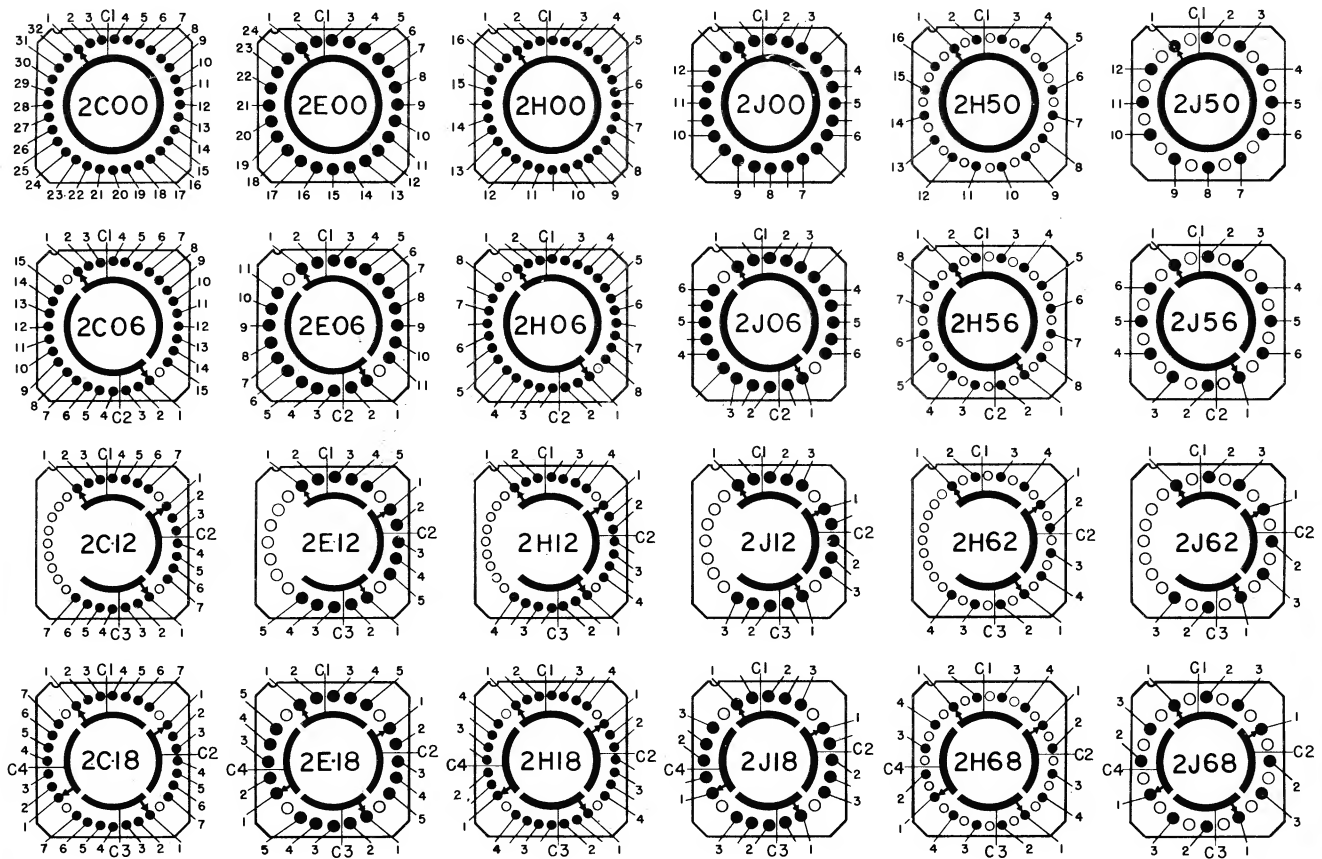
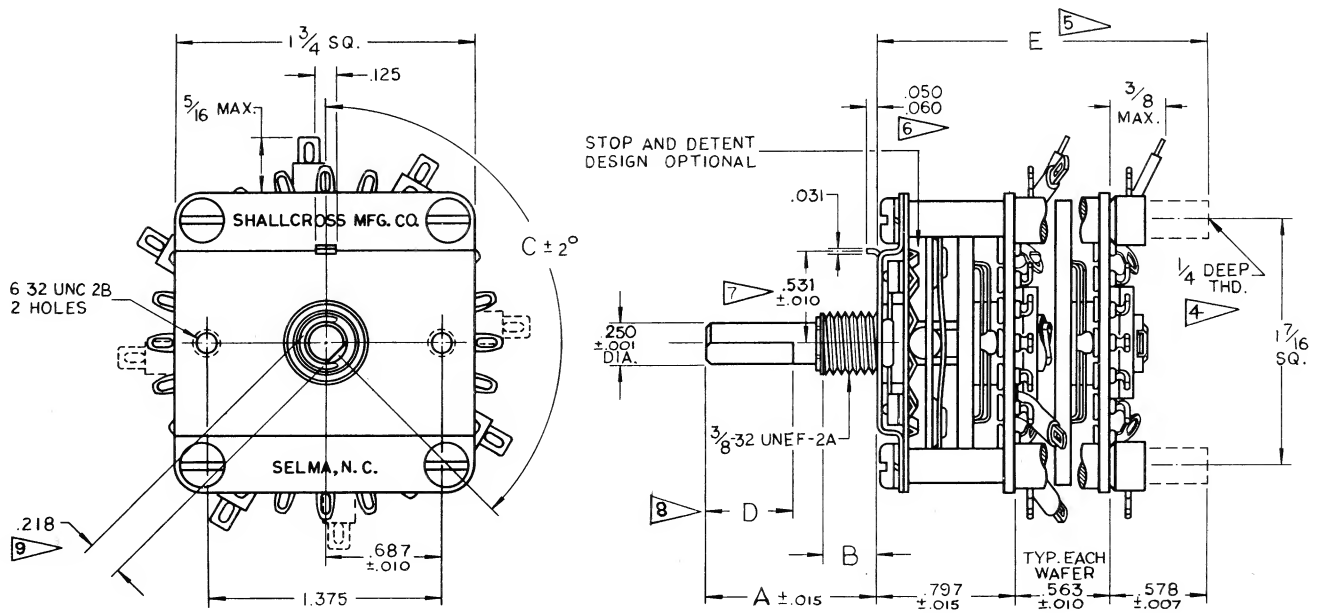
Minimum flat length 3/16". Maximum flat length = shaft length (bushing length + 3/32").

Standard dimension .218"  $\pm .005$ " (optional dimensions available).

|                |            |
|----------------|------------|
| DRAWN _____    | DATE _____ |
| CHECKED _____  | _____      |
| APPROVED _____ | _____      |



## ROTARY SWITCH SPECIFICATION SHEET #2 (MIL-S-3786 ST)





# LE SR14)

| CUSTOMER'S<br>ITEM NO. | SHALLCROSS<br>PART<br>NUMBER | ANGLE<br>OF THROW | POSITIONS<br>PER POLE | NUMBER<br>OF DECKS | POLES PER DECK<br>1, 2, 3 OR 4 | SHAFT<br>LENGTH<br>"DIM."<br>A | BUSHING<br>LENGTH<br>"DIM."<br>B | FLAT<br>ANGLE<br>"DIM."<br>C | FLAT<br>LENGTH<br>"DIM."<br>D | BACK PANEL<br>DEPTH<br>"DIM."<br>E | INDICATE S (SHORTING)<br>OR NS (NON SHORTING)<br>FOR EACH DECK |    | DUST<br>COVER |    | GOLD PLATED<br>CURRENT<br>CARRYING PARTS |    | TERMINAL<br>LOCATIONS                     |
|------------------------|------------------------------|-------------------|-----------------------|--------------------|--------------------------------|--------------------------------|----------------------------------|------------------------------|-------------------------------|------------------------------------|--|----|---------------|----|--|----|---|
|                        |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    | S  | NS | YES           | NO | YES                                      | NO |   |
| -001                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    | AS SHOWN AT LOWER LEFT FOR TYPE SPECIFIED |
| -002                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -003                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -004                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -005                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -006                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -007                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -008                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -009                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |
| -010                   |                              |                   |                       |                    |                                |                                |                                  |                              |                               |                                    |  |    |               |    |  |    |   |

## ELECTRICAL RATINGS (MIL-S-3786 STYLE SR14)

**POWER** (50,000 cycles rotational life at +125°C)

|                         | INDUCTIVE LOAD<br>(2.8 HENRIES) |            | RESISTIVE LOADS<br>(A.C. OR D.C.) |           |
|-------------------------|---------------------------------|------------|-----------------------------------|-----------|
|                         | MILLI-AMPERES                   | VOLTS D.C. | MILLI-AMPERES                     | VOLTS     |
| AT ATMOSPHERIC PRESSURE | 50                              | 30         | 500<br>50                         | 30<br>300 |

## VOLTAGE BREAKDOWN (at atmospheric pressure)

Initial — 1500 volts RMS  
End of life — 1000 volts RMS

## CONTACT RESISTANCE (Maximum)

Initial and after vibration and shock — 5 milliohms  
After moisture resistance and salt spray — 5 milliohms  
After life (rotational) tests — 10 milliohms

**INSULATION RESISTANCE** — Per Mil-S-3786

## MECHANICAL RATINGS

**STOP STRENGTH** — 50 inch/lbs.

**ROTATIONAL TORQUE LIMITS** —

| TEMPERATURE | TORQUE (LB-IN.)                 |         |                               |
|-------------|---------------------------------|---------|-------------------------------|
|             | UP TO 5 SECTIONS<br>OR 10 POLES |         | UP TO 10 DECKS<br>OR 15 POLES |
|             | MINIMUM                         | MAXIMUM | MAXIMUM                       |
| + 25°C      | 1½                              | 6       | 10                            |
| — 65°C      | 1½                              | 8       | 13                            |

## ENVIRONMENTAL RATINGS

**TEMPERATURE RANGE** — 65°C to +125°C

|                |
|----------------|
| CUSTOMER _____ |
| PART NO. _____ |

## ENVIRONMENTAL RATINGS

**VIBRATION** — 10-2000 cps per Mil-S-3786

**SHOCK** — High impact per Mil-S-3786

**SALT SPRAY** — 48 hours per Mil-S-3786

**THERMAL SHOCK** — Per Mil-S-3786

## MATERIALS

DETENT SPRING AND BALLS, SHAFT, MTG. PLATE, STOPS, BUSHING, MTG. HARDWARE, DETENT PLATE, BALL RETAINER, — passivated 18-8 stainless steel

WIPER ARMS — solid spring silver alloy (gold plate optional)

CONTACTS, COLLECTOR RINGS, SEGMENTS — solid silver alloy (gold plate optional)

STATOR (deck plate) — epoxy fiberglass

TERMINALS (integral with contact) — solid silver alloy

COMMON AND CORNER TERMINAL — copper alloy (tin dipped and teflon sleeve insulated)

ROTOR BEARING, ROTOR SPACERS INSULATOR CUPS — nylon

ROTOR — diallyl phthalate (glass fibre reinforced)

STOP PIN RETAINER — nickel silver

SCREWS, STUDS AND DETENT SPACERS — nickel plated brass

DECK SPACERS — steatite

(SUBJECT TO CHANGE)

## NOTES

▽ Life vs. load ratings apply for switches with up to 10 decks or 24 poles (whichever is greater). Life specifications must be derated for switches with greater number of decks or poles.

▽ All dimensions are in inches unless otherwise specified. Tolerances are  $\pm 1/64$ " for fractional dimensions,  $\pm .005$ " for decimal dimensions, and  $\pm 2^\circ$  for angular specifications (unless otherwise specified).

▽ All sections operated by one shaft must have same throw (indexing). Maximum number of positions for one shaft is determined by section with most poles.  $22\frac{1}{2}^\circ$  and  $30^\circ$  throw switches must have adjacent terminals (unnumbered to numbered) connected to obtain shorting action. Decks are numbered sequentially beginning with deck nearest the mtg. plate.

▽ Rear support spacers supplied on 6 decks and over.

▽ Rear support spacers are included in "E" dimension for switches of 6 decks or more only.

▽ Standard tang length is .050" to .060". Optional length .110" to .120" available with .500" spacing from shaft center only.

▽ Standard distance from shaft center to tang center .531" (this dimension is .500"  $\pm$  .010" when .110" to .120" optional tang length is used).

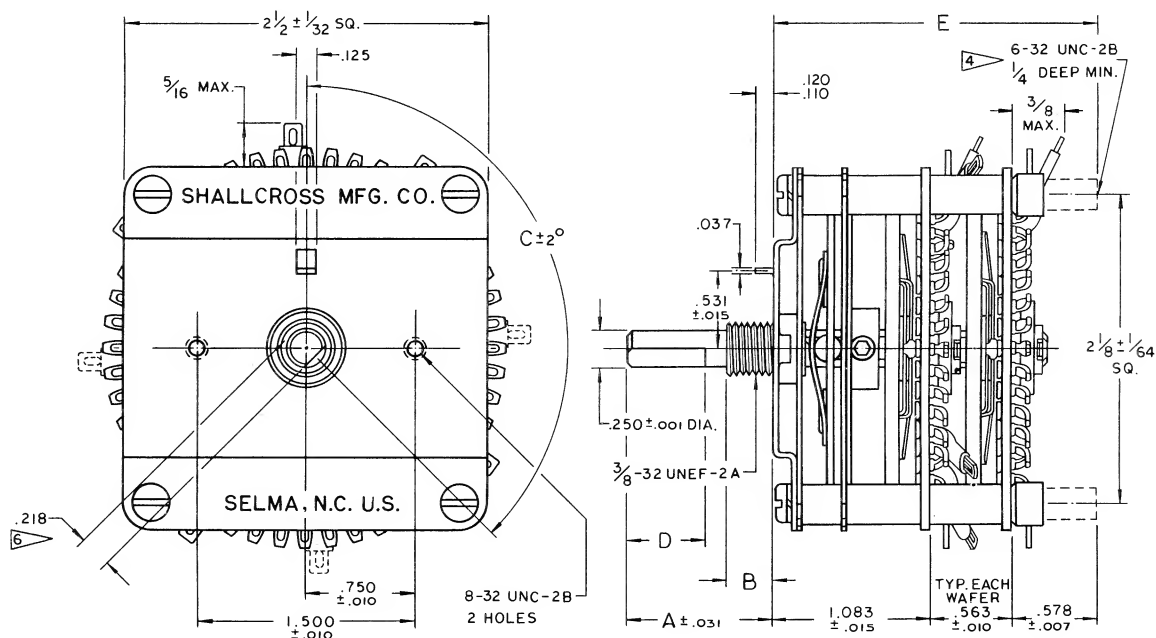
▽ Minimum flat length  $3/16$ ". Maximum flat length = shaft length (bushing length  $+3/32$ ").

▽ Standard dimension .218"  $\pm$  .005" (optional dimensions available).

|                |            |
|----------------|------------|
| DRAWN _____    | DATE _____ |
| CHECKED _____  | _____      |
| APPROVED _____ | _____      |

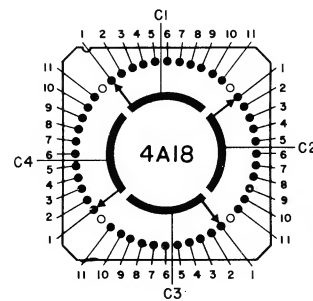
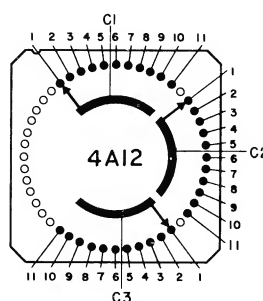
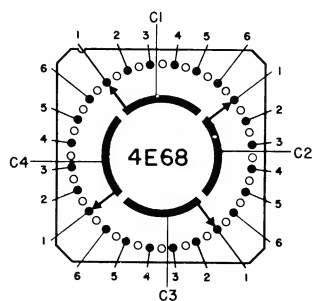
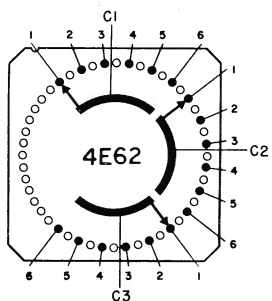
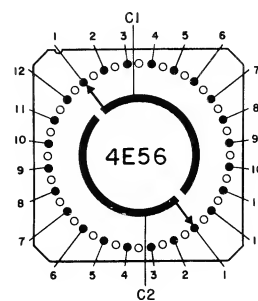
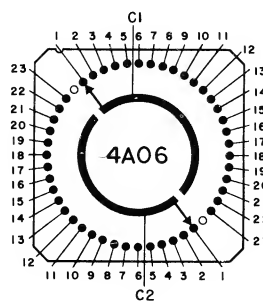
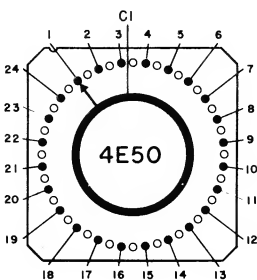
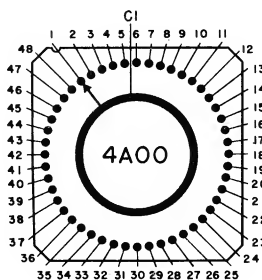


# SHALLCROSS SERIES 4 ROTARY SWITCH SPECIFICATION SHEET #3 (COMMERCIAL)









Standard dimension .218"  $\pm .005$ " (optional dimensions available).

Rear support spacers and nylon cups are supplied (and included in E dimension) on 5 decks and over.





| CUSTOMER'S<br>ITEM NO. | SHALLCROSS<br>PART<br>NUMBER | ANGLE<br>OF THROW | POSITIONS<br>PER POLE | NUMBER<br>OF DECKS | POLES PER DECK<br>1, 2, 3 OR 4 | <br>"DIM.<br>A" | <br>"DIM.<br>B" | <br>"DIM.<br>C" | <br>"DIM.<br>D" | <br>"DIM.<br>E" | INDICATE S (SHORTING)<br>OR NS (NON SHORTING)<br>FOR EACH DECK                      |    | GOLD PLATED<br>CURRENT<br>CARRYING PARTS |    | TERMINAL<br>LOCATIONS |   |
|------------------------|------------------------------|-------------------|-----------------------|--------------------|--------------------------------|--|--|--|--|--|---|----|--|----|-----------------------|---|
|                        |                              |                   |                       |                    |                                |  |  |  |  |  |  |    | YES                                      | NO |                       |   |
|                        |                              |                   |                       |                    |                                |  |  |  |  |  | S   | NS |  |    |                       |   |
| -001                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       | AS SHOWN AT LOWER LEFT FOR TYPE SPECIFIED |
| -002                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -003                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -004                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -005                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -006                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -007                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -008                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -009                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |
| -010                   |                              |                   |                       |                    |                                |  |  |  |  |  |   |    |  |    |                       |   |

AS SHOWN AT LOWER LEFT FOR TYPE SPECIFIED

## ELECTRICAL RATINGS

| LOAD (BREAKING)   | VS. | LIFE (CYCLES) |
|-------------------|-----|---------------|
| LOAD              |     | LIFE          |
| 0 Volts, 0 AMPS   |     | 50,000        |
| 10 VDC, 10 AMPS   |     | 50,000        |
| 30 VDC, 1.0 AMP   |     | 50,000        |
| 100 VDC, 0.5 AMPS |     | 25,000        |
| 120 VAC, 1.0 AMP  |     | 10,000        |
| 120 VAC, 0.5 AMPS |     | 35,000        |

**CURRENT CARRYING CAPACITY** —  
10 Amps (For Temperature Rise  $< 30^{\circ}\text{C}$ )

**VOLTAGE BREAKDOWN** —  
( $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , 50% RH, Sea Level)

|                  | INITIAL (MINIMUM)      | END OF LIFE (MINIMUM)  |
|------------------|------------------------|------------------------|
| BETWEEN POLES    | 2000 V RMS (60 CYCLES) | 1000 V RMS (60 CYCLES) |
| BETWEEN CONTACTS | 1500 V RMS (60 CYCLES) | 800 V RMS (60 CYCLES)  |
| TO GROUND        | 3000 V RMS (60 CYCLES) | 2000 V RMS (60 CYCLES) |
| BETWEEN DECKS    | 6000 V RMS (60 CYCLES) | 4000 V RMS (60 CYCLES) |

## INSULATION RESISTANCE

(room conditions)  $> 10^{12}$

**THERMAL EMF** —  $1\mu$  Volt/ $^{\circ}\text{C}$  (Maximum)

**CONTACT RESISTANCE** — .002 Ohms  
Maximum (Initial)

## MECHANICAL RATINGS

**STOP STRENGTH** — Withstand 50 In./Lb. Rotational Force (Minimum)

## ENVIRONMENTAL RATINGS

**TEMPERATURE RANGE** —  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## MATERIALS

DETENT SPRING AND BALLS, SHAFT, MTG. PLATE, STOPS, BUSHING, MTG. HARDWARE, DETENT PLATE, BALL RETAINER, STOP PIN RETAINER, DETENT SPACERS — passivated stainless steel

WIPER ARMS — solid spring silver alloy (gold plate optional)

CONTACTS, COLLECTOR RINGS (Segments) — solid silver alloy (gold plate optional)

STATOR (DECK PLATE) — epoxy fiberglass

CONTACT LUGS (INTEGRAL WITH CONTACTS) — solid silver alloy

COMMON AND CORNER TERMINALS — copper alloy (tin dipped and teflon sleeve insulated)

ROTOR BEARING, ROTARY SPACERS, INSULATING CUPS — nylon

ROTOR — diallyl phthalate (glass fibre reinforced)

SCREWS AND STUDS — nickel plated brass

DECK SPACERS — steatite

ALL MATERIALS SUBJECT TO CHANGE  
WITHOUT NOTICE

## NOTES

Life vs. load ratings apply for switches with up to 10 decks or 24 poles (whichever is greater). Life specifications must be derated for switches with greater number of decks or poles.

All dimensions are in inches unless otherwise specified. Tolerances are  $\pm 1/64"$  for fractional dimensions,  $\pm .005"$  for decimal dimensions, and  $\pm 2^{\circ}$  for angular specifications, unless otherwise specified.

All sections operated by one shaft must have same throw (indexing). Maximum number of positions for one shaft is determined by section with most poles.

Rear support spacers and nylon cups are supplied (and included in E dimension) on 5 decks and over.

Minimum flat length  $3/16"$ . Maximum flat length = shaft length (bushing length  $+3/32"$ ).

Standard dimension  $.218" \pm .005"$  (optional dimensions available).

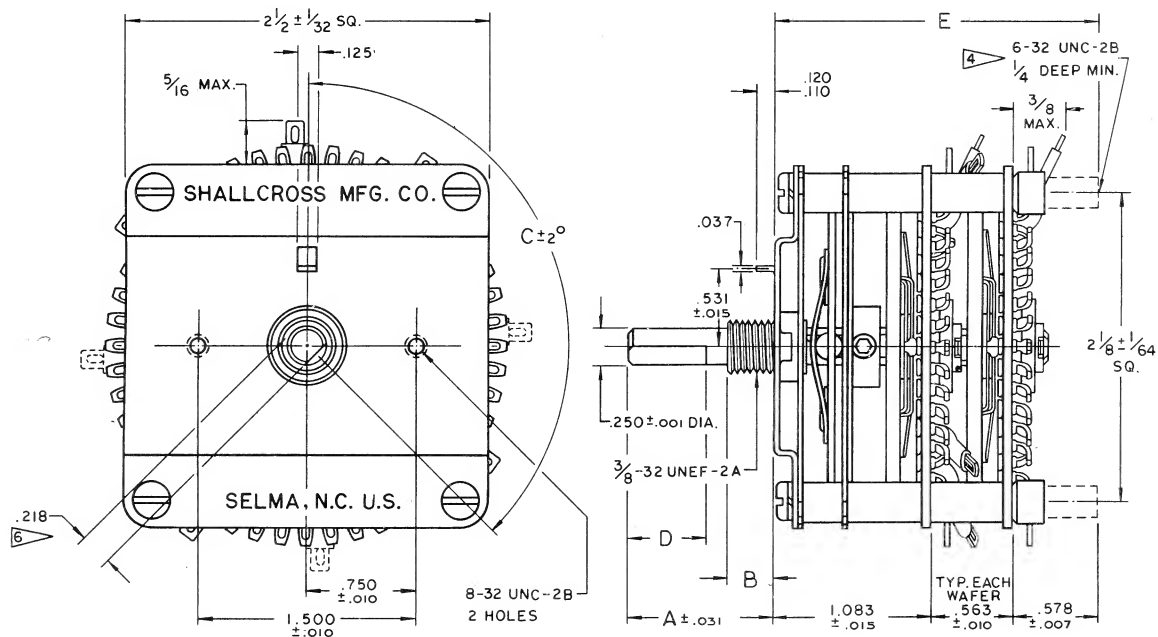
7 Decks are numbered consecutively beginning with deck nearest detent assembly.

DRAWN \_\_\_\_\_ DATE \_\_\_\_\_  
CHECKED \_\_\_\_\_  
APPROVED \_\_\_\_\_

CUSTOMER \_\_\_\_\_  
PART NO. \_\_\_\_\_

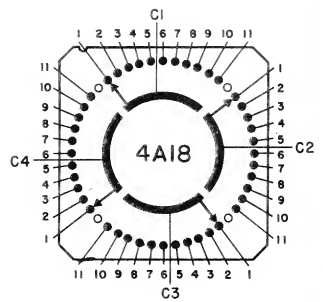
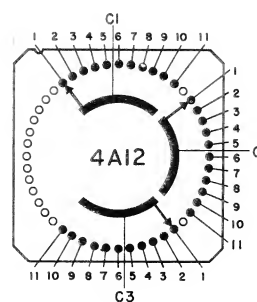
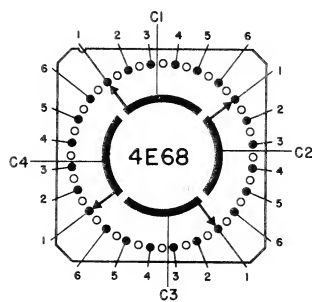
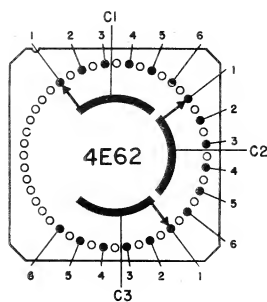
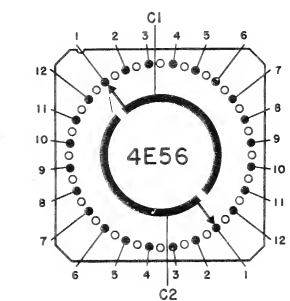
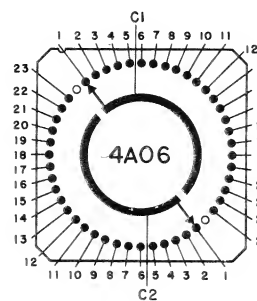
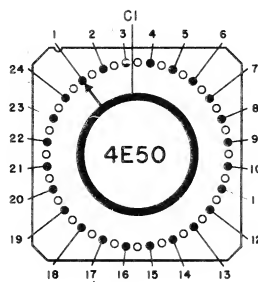
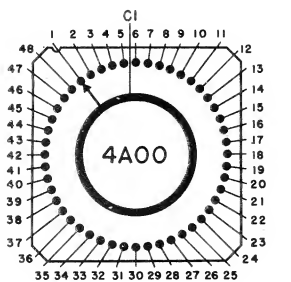


# SHALLCROSS SERIES 4 ROTARY SWITCH SPECIFICATION SHEET #4 (MIL-S-3786 STYLE)









Standard dimension  $.218" \pm .005"$  (optional dimensions available).

Rear support spacers and nylon cups are supplied (and included in E dimension) on 5 decks and over.





| CUSTOMER'S<br>ITEM NO. | SHALLCROSS<br>PART<br>NUMBER | ANGLE<br>OF THROW | POSITIONS<br>PER POLE | NUMBER<br>OF DECKS | POLES PER DECK<br>1, 2, 3 OR 4 | <br>SHAFT<br>LENGTH<br>DIM. A | <br>BUSHING<br>LENGTH<br>DIM. B | <br>FLAT<br>ANGLE<br>DIM. C | <br>FLAT<br>LENGTH<br>DIM. D | <br>BACK PANEL<br>DEPTH<br>DIM. E | INDICATE S (SHORTING)<br>OR NS (NON SHORTING)<br>FOR EACH DECK                      |    | GOLD PLATED<br>CURRENT<br>CARRYING PARTS | TERMINAL<br>LOCATIONS |   |    |
|------------------------|------------------------------|-------------------|-----------------------|--------------------|--------------------------------|--|--|--|---|---|---|----|--|-----------------------|---|----|
|                        |                              |                   |                       |                    |                                |  |  |  |   |   |  |    |  |                       | YES                                       | NO |
|                        |                              |                   |                       |                    |                                |  |  |  |   |   | S   | NS |  |                       |   |    |
| -001                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       | AS SHOWN AT LOWER LEFT FOR TYPE SPECIFIED |    |
| -002                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -003                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -004                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -005                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -006                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -007                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -008                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -009                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |
| -010                   |                              |                   |                       |                    |                                |  |  |  |   |   |   |    |  |                       |   |    |

ELECTRICAL RATINGS

ROTATIONAL LIFE — 25,000 cycles per MIL-S-3786 test condition letter C

| CIRCUIT VALUES FOR LIFE (ROTATIONAL) TEST |                              |            |                                |           |
|---|------------------------------|------------|--------------------------------|-----------|
|   | Inductive load (2.8 henries) |            | Resistive loads (a.c. or d.c.) |           |
|   | Milliamperes                 | Volts D.C. | Milliamperes                   | Volts     |
| AT ATMOSPHERIC PRESSURE                   | 50                           | 30         | 500<br>50                      | 30<br>300 |

CONTACT RESISTANCE

Initial and after vibration and shock ..... 5 milliohms  
After moisture resistance and salt spray .. 5 milliohms  
After life (rotational) tests .....10 milliohms

VOLTAGE BREAKDOWN

Initial ..... 1500 Volts RMS  
End of life ..... 1000 Volts RMS

INSULATION RESISTANCE ..... Per MIL-S3786

MECHANICAL RATINGS

STOP STRENGTH — 50 inch-pounds minimum

ROTATIONAL TORQUE —

| ROTATIONAL — TORQUE LIMITS |         |                        |                          |
|----------------------------|---------|------------------------|--------------------------|
| TORQUE (LB.-IN.)           |         |                        |                          |
| TEMPERATURE                |         | 5 SECTIONS<br>AND LESS | OVER 5 TO 10<br>SECTIONS |
|                            | MINIMUM | MAXIMUM                | MAXIMUM                  |
| Room.....                  | 2       | 6                      | 16                       |
| Minimum.....               | 2       | 8                      | 20                       |

ENVIRONMENTAL RATINGS

VIBRATION — 10-2000 cps per MIL-S-3786

DRAWN \_\_\_\_\_ DATE \_\_\_\_\_

CHECKED \_\_\_\_\_

APPROVED \_\_\_\_\_

ENVIRONMENTAL RATINGS

SALT SPRAY — 48 hours per MIL-S-3786

SHOCK — High Impact per MIL-S-3786

THERMAL SHOCK — Per MIL-S-3786

TEMPERATURE RANGE — -65°C to +125°C

MATERIALS

DETENT SPRING AND BALLS, SHAFT, MTG. PLATE, STOPS, BUSHING, MTG. HARDWARE, DETENT PLATE, BALL RETAINER, STOP PIN RETAINER, DETENT SPACERS — passivated stainless steel

WIPER ARMS — solid spring silver alloy (gold plate optional)

CONTACTS, COLLECTOR RINGS (Segments) — solid silver alloy (gold plate optional)

STATOR (DECK PLATE) — epoxy fiberglass

CONTACT LUGS (INTEGRAL WITH CONTACTS) — solid silver alloy

COMMON AND CORNER TERMINALS — copper alloy (tin dipped and teflon sleeve insulated)

ROTOR BEARING, ROTARY SPACERS, INSULATING CUPS — nylon

ROTOR — diallyl phthalate (glass fibre reinforced)

SCREWS AND STUDS — nickel plated brass

DECK SPACERS — steatite

ALL MATERIALS SUBJECT TO CHANGE WITHOUT NOTICE

NOTES

Life vs. load ratings apply for switches with up to 10 decks or 24 poles (whichever is greater). Life specifications must be derated for switches with greater number of decks or poles.

All dimensions are in inches unless otherwise specified. Tolerances are  $\pm 1/64$ " for fractional dimensions,  $\pm .005$ " for decimal dimensions, and  $\pm 2^\circ$  for angular specifications, unless otherwise specified.

All sections operated by one shaft must have same throw (indexing). Maximum number of positions for one shaft is determined by section with most poles.

Rear support spacers and nylon cups are supplied (and included in E dimension) on 5 decks and over.

Minimum flat length 3/16". Maximum flat length = shaft length - (bushing length  $+ 3/32$ ").

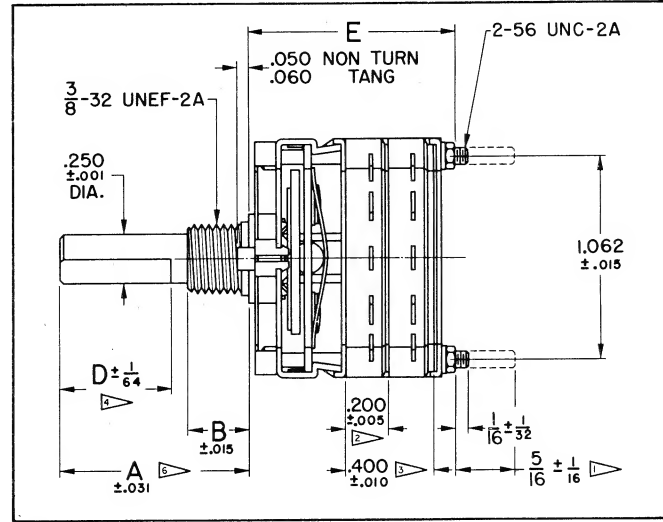
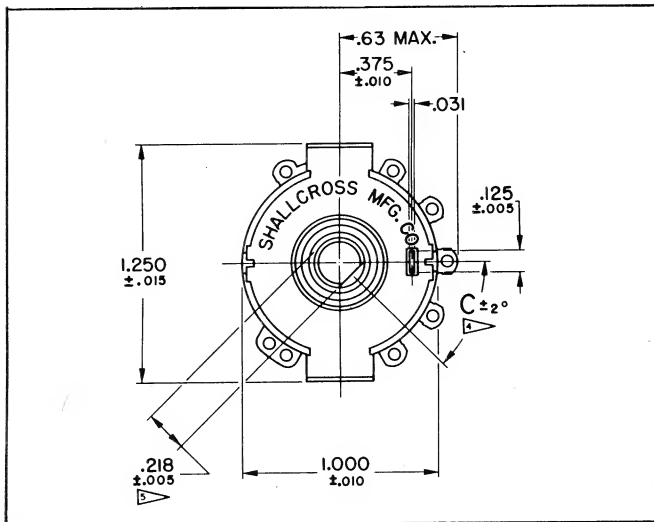
Standard dimension .218"  $\pm .005$ " (optional dimensions available).

Decks are numbered consecutively beginning with deck nearest detent assembly.

CUSTOMER \_\_\_\_\_

PART NO. \_\_\_\_\_

# SHALLCROSS SERIES 1 ROTARY SWITCH SPECIFICATION SHEET #5 (COMMERCIAL)



| SHALLCROSS SERIES | TERMINAL LOCATIONS AND WAFER CONFIGURATIONS VIEWED FROM MTG. PLATE WITH MOVING CONTACT IN #1 POSITION AND MTG. TANG AT 90° (3 O'CLOCK) |
|-------------------|--|
| 1J04              | <p>EVEN AND ODD WAFERS</p>   |
| 1J06              | <p>EVEN WAFERS      ODD WAFERS</p>   |
| 1J00              | <p>EVEN WAFERS      ODD WAFERS</p>   |
| 1J02              | <p>EVEN WAFERS      ODD WAFERS</p>   |

SHORTING SWITCHES

| SHALLCROSS SERIES | TERMINAL LOCATIONS AND WAFER CONFIGURATIONS VIEWED FROM MTG. PLATE WITH MOVING CONTACT IN #1 POSITION AND MTG. TANG AT 90° (3 O'CLOCK) |
|-------------------|--|
| 1J54              | <p>EVEN AND ODD WAFERS</p>   |
| 1J56              | <p>EVEN WAFERS      ODD WAFERS</p>   |
| 1J50              | <p>EVEN WAFERS      ODD WAFERS</p>   |
| 1J52              | <p>EVEN WAFERS      ODD WAFERS</p>   |

NONSHORTING SWITCHES



| CUSTOMER'S<br>ITEM NO. | SHALLCROSS<br>PART<br>NUMBER | ANGLE<br>OF THROW | POSITIONS<br>PER POLE | NUMBER<br>OF POLES | SHAFT<br>LENGTH<br>DIM. "A" | BUSHING<br>LENGTH<br>DIM. "B" | FLAT<br>ANGLE<br>DIM. "C" | FLAT<br>LENGTH<br>DIM. "D" | BACK PANEL<br>DEPTH<br>DIM. "E" | INDICATE S (SHORTING)<br>OR NS (NON SHORTING)<br>FOR EACH POLE |    | GOLD PLATED<br>CURRENT<br>CARRYING PARTS |    | TERMINAL<br>LOCATIONS                     |
|------------------------|------------------------------|-------------------|-----------------------|--------------------|-----------------------------|-------------------------------|---------------------------|----------------------------|---------------------------------|--|----|--|----|---|
|                        |                              |                   |                       |                    |                             |                               |                           |                            |                                 | S  | NS | YES                                      | NO |   |
| -001                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    | AS SHOWN AT LOWER LEFT FOR TYPE SPECIFIED |
| -002                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -003                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -004                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -005                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -006                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -007                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -008                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -009                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |
| -010                   |                              |                   |                       |                    |                             |                               |                           |                            |                                 |  |    |  |    |   |

## RATINGS (COMMERCIAL)

| LOAD (BREAKING) | VS. | LIFE (CYCLES) |
|-----------------|-----|---------------|
| LOAD            |     | LIFE          |
| No Load         |     | 50,000        |
| 100 VDC — .25A  |     | 50,000        |
| 125 VAC — .25A  |     | 50,000        |
| 30 VDC — .5A    |     | 50,000        |

### CURRENT CAPACITY —

10 Amps (For temperature rise < 30°C)

| VOLTAGE BREAKDOWN                 |                       |                       |
|-----------------------------------|-----------------------|-----------------------|
| —55°C To +85°C, 50% RH, Sea Level |                       |                       |
|                                   | Initial (Minimum)     | End of Life (Minimum) |
| Between Poles                     | 2000V RMS (60 Cycles) | 1500V RMS (60 Cycles) |
| Between contacts                  | 1000V RMS (60 Cycles) | 800V RMS (60 Cycles)  |
| To Ground                         | 2000V RMS (60 Cycles) | 1500V RMS (60 Cycles) |

### INSULATION RESISTANCE

(room conditions)

Initial — > 10<sup>12</sup> Ohms

End of Life — > 10<sup>10</sup> Ohms

| CAPACITANCE                         |                 |
|-------------------------------------|-----------------|
| Points of Measurement               | Capacitance     |
| Between adjacent contacts           | .5 uuf (Max.)   |
| Between contact and common terminal | .9 uuf (Max.)   |
| Between common and frame            | 10.0 uuf (Max.) |
| Between poles                       | 5.0 uuf (Max.)  |

### CONTACT RESISTANCE (INITIAL)

2—6 Pos./Pole Switch Types—.0025 Ohm Max.

7—12 Pos./Pole Switch Types—.0035 Ohm Max.

THERMAL EMF—1u Volt/°C (Max.)

STOP STRENGTH—Withstand 25 in/lb Rotational Force

TERMINAL STRENGTH—Withstand 5 lb. pull three mutually perpendicular planes

TEMPERATURE RANGE — -40°C to +85°C (Where all commercial rating are to be met)

DRAWN \_\_\_\_\_ DATE \_\_\_\_\_

CHECKED \_\_\_\_\_

APPROVED \_\_\_\_\_

## MATERIALS

STOP RETAINER, MTG. PLATE, DETENT PARTS, COVER PLATE, WASHERS, STOP PIN, SCREWS, NUTS, SHAFT, ROTOR GUIDE — stainless steel (passivated)  
CONTACT ARMS — Beryllium copper (silver plated)  
ROTOR CONTACTS (MOVING), STATOR CONTACTS (STATIONARY) AND INTEGRAL TERMINALS — silver alloy  
ROTOR INSULATOR — Lexan  
STATOR — Diallyl Phthalate (glass filled)

## NOTES

1 Add on dimension to provide rear support accommodations for 11 or more wafers only.

### BACK OF PANEL DIMENSION "E"

2 See back of panel dimension chart for wafer/pole and exact back panel dimension per switch type.

3 See back panel dimension chart for wafer/pole and exact back panel dimension per switch type.

### SHAFT FLAT DIM. "C" & DIM. "D"

4 Flatted shafts not supplied unless specified. Minimum flat length 3/16". Maximum flat length=shaft length - (bushing length + 3/32").

5 Flatted shafts when specified will be cut to the standard dimension shown (optional dimensions available).

### SHAFT LENGTHS DIM. "A"

6 Shaft lengths are measured from end of shaft to mounting surface. Standard shaft length is one inch ± .031. Optional shaft lengths from 5/8" to 2" are available.

### STANDARD MTG. BUSHING LENGTHS DIM. "B"

7 5/16 1/2 3/8 3/4  
(Optional dimensions available).

8 Poles are numbered sequentially beginning with pole nearest mounting plate.

9 All dimension are in inches with tolerances as shown.

10 Load life ratings apply up to 10 poles (2-6 pos./pole) or 5 poles (7-12 pos./pole). Life may require derating for larger number of poles.

CUSTOMER \_\_\_\_\_

PART NO. \_\_\_\_\_



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## REPRESENTATIVES

### ALBUQUERQUE

Vinson Associates  
P. O. Box 3295  
Albuquerque, New Mexico  
Phone: 505-298-7442

### BOSTON

Forsberg Sales  
125 Perkins Avenue  
Brockton, Massachusetts  
Phone: 617-522-6300  
TWX: 710-345-0194

### CHICAGO

Jay C. Angel and Company  
2743 West Peterson Avenue  
Chicago, Illinois 60645  
Phone: 312-878-0653  
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A. C. Wahl and Associates  
P. O. Box 15220  
135 Williams Ave. Lockland  
Cincinnati, Ohio  
Phone: 513-821-3270  
TWX: 513-577-1068

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A. C. Wahl and Associates  
24232 Maria Lane  
North Olmsted, Ohio  
Phone: 216-777-2899

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Forsberg Sales  
P. O. Box 128  
North Branford, Connecticut  
Phone: 203-488-7995

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The Gordon V. Peck Company  
210 Casa Linda Plaza  
P. O. Box 18627  
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2122 Marshon Avenue  
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110 Tucker Building  
Englewood, Colorado  
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TWX: 303-789-1649

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L. T. Martenson  
46 Ridge Road  
Pleasant Ridge, Michigan  
Phone: 313-543-3633

### FLORIDA

Technical Marketing, Inc.  
755 West Fairbanks Avenue  
Winter Park, Florida  
Phone: 305-647-6223  
TWX: 305-647-0125

### HOUSTON

The Gordon V. Peck Company  
5757 Bellaire Boulevard  
Houston 25, Texas  
Phone: 713-664-1435  
TWX: 713-571-2076

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Thomas & Modrcin Assoc., Inc.  
5450 Buena Vista Drive  
Shawnee Mission, Kansas 66205  
Phone: 913-432-2131

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El Segundo, California  
Phone: 213-322-1561  
TWX: 213-322-3394

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Minneapolis, Minnesota 55416  
Phone: 612-929-6115

### MISSOURI

Thomas & Modrcin  
47 Village Square  
Hazelwood, Missouri  
Phone: 314-838-6446

### NEW YORK

B. B. Taylor Corporation  
2270 Grand Avenue  
Baldwin, New York  
Phone: 516-223-8000  
TWX: 516-863-9878

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Hall Road  
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TWX: 510-660-1979

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Pittsburgh, Pennsylvania 15237  
Phone: 412-931-6700

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228 Winton Road, North  
Rochester 10, New York  
Phone: 716-482-7757

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Westec Electronics  
4117 El Camino Way  
Palo Alto, California  
Phone: 415-327-5850

### SEATTLE

Jon B. Jolly  
69 Marion Street  
Seattle, Washington  
Phone: 206-623-7060

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DeWitt, New York  
Phone: 315-G16-3330

### TULSA

The Gordon V. Peck Company  
P. O. Box 15671  
552 S. Allegheny  
Tulsa 12, Oklahoma  
Phone: 918-939-3047

### CANADA

Aero Sales Engineering Co.  
Div. of Garrett Mfg. Limited  
4 Racine Road  
Rexdale, Ontario, Canada  
Phone: 416-249-9139

### OVERSEAS

#### FRANCE

Spetelec  
12 Rue le Chatelier  
Paris, France  
Phone: 425-05-23

#### JAPAN

Kyokuto Boeki Kaisha, Ltd.  
C. P. O. Box 330  
7th Floor, New Otemachi Bldg.  
4, 2-chrome, Otemachi  
Chiyoda - ku  
Tokyo, Japan  
Phone: 270-7711  
TELEX No.: TK 2440

#### SWEDEN

Elektriska Instruments  
Box 1237, Bromma 12  
Lovasvagen 40-42, Ulvsunda  
Stockholm C, Sweden  
Phone: 26-27-20

#### SWITZERLAND

Baelocher ag  
Foerrlibuckstrasse 110  
Zuerich 5, Switzerland  
Phone: 051-42-99-00



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## DISTRIBUTORS

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Westec Distributing Co.  
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Phone: 322-1561  
Area Code: 213  
TWX: 213-322-3394

### ILLINOIS

Allied Electronics  
100 North Western Avenue  
Chicago, Illinois 60680  
Phone: TA 9-9100  
Area Code: 312  
TWX: 312-431-1721

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125 Perkins Avenue  
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TWX: 516-868-9002

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135 Williams Ave., Lockland  
Cincinnati, Ohio 45215  
Phone: 821-3270  
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TWX: 513-577-1068

### PENNSYLVANIA

Samco Electronic Sales  
P. O. Box 245  
Fairview Village, Pennsylvania  
19409  
Phone: 275-2600  
Area Code: 215  
TWX: 510-660-1979

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3903-05 Richmond Avenue  
Houston, Texas 77027  
Phone: 666-2401  
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Arlington, Texas  
Phone: CR7-2231  
Area Code 817  
TWX 910-890-5115

SHALLCROSS MANUFACTURING COMPANY, PRESTON STREET, SELMA, NORTH CAROLINA 27576  
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(list new address)

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MAN. THIS PRODUCT  
INFORMATION SHOULD  
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and address)**

**TITLE**.....

**COMPANY**.....

☐ **REMOVE MY NAME  
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LIST. I AM NO LONGER  
INVOLVED IN YOUR  
PRODUCT AREA (list  
name and address)**

**ADDRESS**.....

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